PROJECT MANUAL

JANUARY 14, 2019

VLK | ARCHITECTS

Bryson ES, Elkins ES, Eagle Mountain ES, & Boswell HS Additions & Renovations

EAGLE MOUNTAIN-SAGINAW I.S.D.

FORT WORTH, TEXAS

VLK Project No.

1857.00

OWNER:

Eagle Mountain-Saginaw Independent School District

1200 Old Decatur Rd

Fort Worth, TX 76179

OWNER

Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Rd
Fort Worth, TX 76179

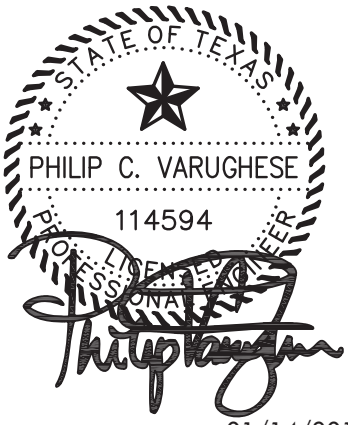
ARCHITECT

VLK Architects, Inc.
Donald A. Steer, AIA LEED® AP
2821 West 7th Street, Suite 300
Fort Worth, Texas 76107
Phone: 817.633.1600
www.vlkarchitects.com

01/14/2019

CIVIL ENGINEER

Teague, Nall & Perkins, Inc.
Firm Registration Number F-230
Philip C. Varughese, P.E.
5237 N. Riverside Drive, Suite 100
Fort Worth, Texas 76137
Phone: 817.336.5773
www.tnpinc.com



01/14/2019

LANDSCAPE/IRRIGATION

Teague, Nall & Perkins, Inc.
Firm Registration Number F-230
William H Smith, RLA
Joe Madrid, RLA, LI
5237 N. Riverside Drive, Suite 100
Fort Worth, Texas 76137
Phone: 817.336.5773
www.tnpinc.com

01/14/2019

01/14/2019

PROJECT MANUAL

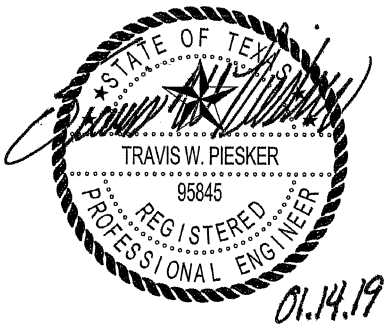
JANUARY 14, 2019

Bryson ES, Elkins ES, Eagle Mountain ES, & Boswell HS Additions & Renovations
EAGLE MOUNTAIN-SAGINAW I.S.D.
FORT WORTH, TEXAS

VLK Project No.
1857.00

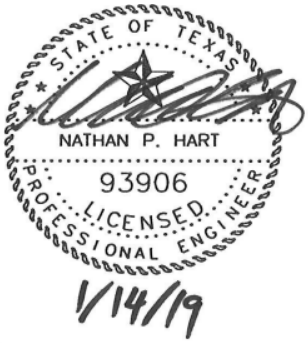
STRUCTURAL ENGINEER

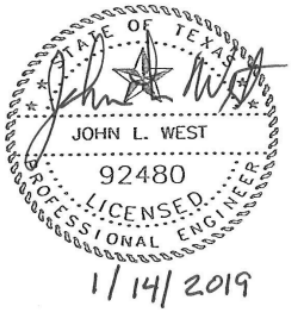
L.A. Fuess Partners, Inc.
Firm Registration Number F-537
Travis W. Piesker, P.E.
3333 Lee Parkway, Suite 300
Dallas, TX 75219
Phone: 214.871.7010
www.lafp.com



MEP ENGINEER

Reed, Wells, Benson & Co.
Firm Registration Number: F-2176
Nathan P. Hart, P.E.
John West, P.E.
Coit Central Tower, Suite 1100, Box 103
12001 North Central Expressway
Dallas, Texas 75243
Phone: 972.788.4222
www.rwb.net





FOOD SERVICE

Foodservice Design Professionals
Lance Brooks
2655 Villa Creek Dr., #233
Dallas, Texas 75234
Phone: 972.245.5331
www.foodservicedesignprofessionals.com

PROJECT MANUAL

JANUARY 14, 2019

Bryson ES, Elkins ES, Eagle Mountain ES, & Boswell HS Additions & Renovations
EAGLE MOUNTAIN-SAGINAW I.S.D.
FORT WORTH, TEXAS

VLK Project No.
1857.00

DOCUMENT 00 01 10

TABLE OF CONTENTS

01/14/2019

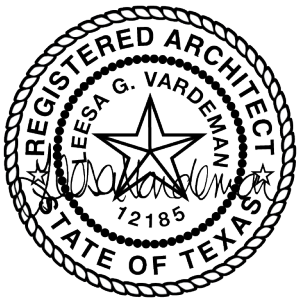
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

PROCUREMENT REQUIREMENTS

EM-S ISD - Request for Competitive Sealed Proposals (RFCSP) Cover Sheet
EM-S ISD - Request for Competitive Sealed Proposals Table of Contents
Document 00 11 13 - Advertisement for Proposals
00 21 16 - Instructions to Proposers
00 22 16 - Eagle Mountain-Saginaw Supplementary Instructions to Proposers
* 00 31 32 - (Reference Section below - out of sequence)
00 42 00 - Part “A” Proposal Form - Base Proposal
Form A - CSP Response Form
Form B - Deviation/Compliance Signature Form
Form C - Non-Collusion Statement
Form D - Criminal Background Check and Felony Conviction Notification
Form E - Nonresident Bidder’s Certification
Form F - Debarment or Suspension Certification Form
Form G - Compliance with House Bill 1295 Certificate of Interested Parties
Form H - Conflict of Interest Questionnaire - Form CIQ
Form I - Notification of Hazardous Materials Affidavit
Form J - Compliance with House Bill 89 and Senate Bill 252
Form K - Business References Form
Form L - Contractor Data Form
00 43 00 - Part “B” Proposal Form - Qualifications
00 43 93 - Proposal Submittal Checklist
* 00 31 32 - Geotechnical Data
00 45 16 - Contractor’s Qualification Statement, AIA Document A305-1986

CONTRACTING REQUIREMENTS

Document 00 52 00 - Standard Form of Agreement Between Owner and Contractor, AIA Document A101-2017 (Modified)
00 61 13.13 - Performance Bond Form
00 61 13.16 - Payment Bond Form
00 65 00 - Release of Lien Documents
00 72 00 - General Conditions of the Contract for Construction, AIA Document A201-2017 (Modified)
00 73 46 - Prevailing Wage Rates
00 73 50 - Weather Table



01/14/2019

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 - MASONRY

DIVISION 05 - METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

01/14/2019

Section 07 11 13 - Bituminous Dampproofing
07 21 00 - Building Insulation
07 21 19 - Foamed-in-Place Insulation
07 26 00 - Vapor Retarders
07 27 26 - Fluid-Applied Membrane Air Barriers
07 46 00 - Preformed Siding
07 53 00 - Single-ply Membrane Roofing
07 62 00 - Sheet Metal Flashing and Trim
07 65 00 - Flexible Flashing
07 72 13 - Manufactured Roof Curbs and Portals
07 81 16 - Cementitious Fireproofing
07 84 00 - Firestopping
07 92 00 - Joint Sealants
07 95 00 - Expansion Control

DIVISION 08 - OPENINGS

Section 08 11 00 - Hollow Metal Doors and Frames
08 14 00 - Wood Doors
08 14 23 - Plastic-laminate-faced Wood Doors
08 31 00 - Access Doors
08 41 13 - Aluminum-framed Entrances and Storefronts
08 71 00 - Door Hardware
08 80 00 - Glazing

DIVISION 09 - FINISHES

Section 09 21 16 - Gypsum Board Assemblies
09 30 13 - Ceramic Tiling
09 51 00 - Acoustical Ceilings
09 65 00 - Resilient Flooring
09 65 66 - Athletic Sheet Flooring
09 68 13 - Tile Carpeting
09 84 13 - Fixed Sound-absorptive/Sound-reflective Panels
09 91 00 - Painting
09 99 00 - Color Schedule

DIVISION 10 - SPECIALTIES

Section 10 14 00 - Identifying Devices
10 21 15 - Solid Phenolic Toilet Compartments
10 22 39.13 - Folding Glass-panel Partitions
10 28 00 - Toilet Accessories
10 44 13 - Fire Extinguishers and Cabinets
10 73 26 - Prefabricated Walkway Covers

DIVISION 11 - EQUIPMENT

Section 11 52 13 - Projection Screens
11 66 00 - Athletic Equipment
11 68 13 - Playground Equipment

DIVISION 12 - FURNISHINGS

NONE IN THIS PROJECT

DIVISION 13 - SPECIAL CONSTRUCTION

NONE IN THIS PROJECT

01/14/2019

DIVISION 14 - CONVEYING EQUIPMENT

NONE IN THIS PROJECT

DIVISIONS 15 through 20 - Not used.

DIVISION 21 - FIRE SUPPRESSION

Section 21 00 00 - Fire Suppression
21 05 00 - Common Work Results for Fire Suppression
21 13 13 - Wet Pipe Fire Sprinkler Systems

DIVISION 22 - PLUMBING

Section 22 00 00 - Plumbing
22 05 00 - Common Work Results for Plumbing
22 05 53 - Identification for Plumbing Equipment and Piping
22 07 00 - Plumbing Insulation
22 11 16 - Domestic Water Piping System
22 11 23 - Natural Gas Piping System
22 13 16 - Sanitary Waste and Vent System
22 14 00 - Storm Drainage System
22 21 13 - Plumbing Piping Systems
22 42 00 - Plumbing Fixtures

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

Section 23 00 00 - Heating, Ventilating, and Air Conditioning (HVAC) Work
23 05 00 - Common Work Results for HVAC
23 05 13 - Common Motor Requirements for HVAC
23 05 14 - Common Motor Starter Requirements for HVAC Equipment
23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment
23 05 53 - Identification for HVAC Equipment and Piping
23 05 93 - Testing, Adjusting, and Balancing (TAB) for HVAC
23 07 00 - Insulation
23 08 00 - Mechanical Systems Commissioning
23 09 00 - Controls and Instrumentation
23 21 13 - Hydronic Piping
23 30 00 - HVAC Air Distribution
23 34 00 - Exhaust and Supply Air Fans
23 81 33 - Semi-Customized Rooftop Air Conditioning Units (Gas-Electric) (3 Tons and Larger)

DIVISIONS 24 and 25 - Not used.

01/14/2019

DIVISION 26 - ELECTRICAL

Section 26 00 00 - Electrical
- 26 05 19 - Low Voltage Electrical Power Conductors and Cables
- 26 05 20 - Cable Connections
- 26 05 23 - Control-Voltage Electrical Power Cables
- 26 05 26 - Grounding and Bonding for Electrical Systems
- 26 05 29 - Hangers and Supports for Electrical Systems
- 26 05 32 - Raceways
- 26 05 33 - Boxes for Electrical Systems
- 26 05 53 - Identification for Electrical Systems
- 26 05 73 - Electric Power System Analysis
- 26 09 26 - Occupancy Sensor Lighting Controls Systems
- 26 09 27 - Lighting Control Panelboards
- 26 22 13 - Low Voltage Distribution Transformers
- 26 24 13 - Circuit Breaker Distribution Switchboards
- 26 24 16 - Panelboards
- 26 27 16 - Electrical Cabinets and Enclosures
- 26 27 26 - Wiring Devices
- 26 28 13 - Fuses
- 26 28 16 - Enclosed Switches and Circuit Breakers
- 26 43 13 - Surge Suppression Devices
- 26 51 01 - Interior Lighting

DIVISION 27 - COMMUNICATIONS

NONE IN THIS PROJECT

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

Section 28 31 10 - Fire Detection and Alarm - Expansion of Existing Systems

DIVISIONS 29 and 30 - Not used.

DIVISION 31 - EARTHWORK

Section 31 00 00 - Earthwork
- 31 10 00 - Site Clearing
- 31 23 13 - Building Subgrade Preparation
- 31 23 33 - Trenching and Backfilling
- 31 31 00 - Soil Treatment
- 31 32 00 - Soil Stabilization
- 31 63 29 - Drilled Piers

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section 32 13 13 - Concrete Paving
- 32 17 23 - Pavement Marking
- 32 18 16.13 - Playground Protective Surfacing
- 32 31 13 - Chain Link Fences and Gates
- 32 31 32 - Composite Fences and Gates
- 32 84 00 - Planting Irrigation
- 32 92 23 - Sodding
- 32 93 00 - Trees, Shrubs, and Groundcover

DIVISION 33 - UTILITIES

Section 33 10 00 - Water Utilities
- 33 40 00 - Storm Drainage Utilities

DIVISIONS 34 through 49 - Not used.

Eagle Mountain-Saginaw Independent School District

REQUEST FOR COMPETITIVE SEALED PROPOSALS (RFCSP)

RFCSP Number: 1819-017-0

RFCSP Title: Bryson ES, Elkins ES, Eagle Mountain ES & Boswell HS Additions & Renovations

Due Date: February 7, 2019

Prior to: 2:00 P.M. CST

Sealed CSP will be received in accordance with the attached specifications. The sealed envelope containing your CSP should be plainly marked with the CSP title, number, and opening date and time. CSPs are publicly opened. You are invited to attend. **PLEASE NOTE: Late CSPs WILL NOT be accepted.**

Mail or deliver one original and three copies of the complete CSP package to:

Eagle Mountain-Saginaw Independent School District
Attn: Lucia Cieszlak
Director of Purchasing
1200 Old Decatur Rd., **Business Building #6**
Fort Worth, Texas 76179

All questions must be submitted in writing (email preferred) and received on or before seven (7) calendar days prior to the opening date. **No verbal responses will be provided.** Please note that CSP tabulations are available on our website (www.emsisd.com/Departments/Purchasing/Bid Tabulations). Address questions to:

Lucia Cieszlak
Email: lcieszlak@ems-isd.net

PROPOSER IDENTIFICATION: (*Please print information clearly.)*

Firm Name:	_____	Date:	_____
Address:	_____	Phone:	_____
	_____	Fax:	_____
City/St/Zip:	_____	Email:	_____

You MUST sign the CSP Response form (page 4) in order for your CSP to be accepted.

TABLE OF CONTENTS

DOCUMENT 00 11 13

ADVERTISEMENT FOR PROPOSALS

Competitive Sealed Proposals for the construction of "**Bryson ES, Elkins ES, Eagle Mountain ES & Boswell HS Additions & Renovations"**, Eagle Mountain-Saginaw I.S.D., Fort Worth, Texas, will be received by Lucia Cieszlak, Director of Purchasing, in the Purchasing Department of the Eagle Mountain-Saginaw Independent School District, located at 1200 Old Decatur Road, **Building #6**, Fort Worth, Texas 76179.

The Proposals shall be received by **Thursday, February 7, 2019 prior to 2:00 p.m. CST** in two parts as follows:
PART "A " PROPOSAL FORM - BASE PROPOSAL and PART "B" PROPOSAL FORM - QUALIFICATIONS

Proposals received after this time will not be accepted.

The clock located in the EMSISD Purchasing Department is considered the official time for receiving and opening CSPs.

The Project Manual, Drawings and Addenda are available on the Eagle Mountain-Saginaw ISD website (www.emsisd.com/Departments/Purchasing/Bid Opportunities). Addenda will only be published on the website. No addenda will be mailed, e-mailed, or faxed to any document holder

Any proposer may withdraw his proposal, either personally or by written request, at any time prior to the scheduled time for opening proposals. No proposer may withdraw his proposal for a period of 60 days after the date set for opening thereof, and any proposal shall be subject to acceptance by the Owner during this period.

Proposal Security in the amount of five percent (5%) of the proposal sum must accompany each proposal.

The Owner reserves the right to reject any or all proposals and to waive any formality in connection therewith.

Within 45 days after the opening of the sealed proposals, the District will evaluate and rank each proposal submitted in relation to the selection criteria set forth. The District will select the proposal that offers the best value to the District based on the selection criteria and on the ranking evaluation; price alone will not be determinative.

PRE-PROPOSAL CONFERENCE

A pre-proposal conference is scheduled for 1:00 pm, local time, Wednesday, January 30, 2019 at Bryson Elementary School of the Eagle Mountain-Saginaw Independent School District located at 8601 Old Decatur Rd., Fort Worth, TX 76179, with representatives of the Owner, Architect, and Engineer available to address proposal document issues with potential proposers. A site visit to each campus will be made available after the pre-proposal conference.

DOCUMENT 00 21 16

INSTRUCTIONS TO PROPOSERS

PART 1 - GENERAL

1.1 DEFINITIONS

A. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, 2007 Edition and Section 01 42 16 - Definitions, are applicable to these Instructions to Proposers.

B. Proposal documents include the Request for Competitive Sealed Proposals, Instructions to Proposers, the Proposal Forms and the proposed Contract Documents, including Addenda issued prior to receipt of proposals.

C. Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the proposal documents, including Drawings and Specifications, by additions, deletions, clarifications or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed.

D. "VLK Architects, Inc." will be hereafter referred to in this Project Manual as "Architect" and correspondence shall be addressed to: 2821 West 7th Street, Suite 300, Fort Worth, TX 76107.

1.2 EXAMINATION OF DOCUMENTS AND SITE

A. Each proposer, by making his Proposal, represents that he has read and understands the Proposal Documents.

B. Each proposer, by making his Proposal, represents that he has visited the site, performed investigations and verifications as necessary and familiarized himself with the local conditions under which the Work is to be performed and will be responsible for errors in his proposal resulting from his failure to do so.

C. Each proposer by making his proposal represents that his proposal is based upon the materials, systems and equipment required by the Proposal Documents without exception.

1.3 QUESTIONS

A. Proposers shall submit questions about the Proposal Documents to Lucia Cieszlak, lcieszlak@ems-isd.net in writing not later than seven days prior to the date of receipt of the proposals. Replies will be issued to proposers as an addendum to the Proposal Documents and shall become a part of the Contract. The Architect and Owner will not be responsible for oral clarification.

1.4 SUBSTITUTIONS

A. Each proposer represents by submitting his proposal that his proposal is based upon the materials and equipment described in the proposal documents.

1.5 PROPOSAL SECURITY

A. A certified check; cashier's check; signed, dated and embossed proposal bond in an amount equal to 5% of the largest possible total proposal and made payable to the Owner must accompany each proposal. This shall be considered as the amount of liquidated damages, which the Owner will sustain, by failure or refusal of the proposer to execute and deliver the contract and the statutory performance and payment bonds should the Contract be awarded to him.

B. If the proposer defaults in executing and delivering the Contract and the statutory performance and payment bonds within ten days after written notification from the Owner of the award of Contract to him, then the check or proposal bond shall become the property of the Owner, not as a penalty, but as liquidated damages, as payment for damages due to excess costs, delay and other inconveniences.

C. Proposals shall remain in effect for a period of 60 days after the time established for receipt thereof, and during this time the Owner may accept or reject the proposals as he so elects. If the proposal is not accepted within 60 days after the time set for submission of proposals, or if the successful proposer executes and delivers said contract and the performance and payment bonds, then the check or proposal bond will be returned.

D. Proposal Bond shall be executed by a Surety Company that is:
   1. Approved by the school district, and duly authorized and admitted to do business in the State of Texas as determined by the State Board of Insurance.
   2. Listed by the United States Department of the Treasury in that issue of the "Federal Register" covering the date on which the bond was executed and the date that Surety Company has obtained reinsurance, if applicable, from a reinsurer that is authorized and admitted as a reinsurer in this state and is the holder of a certificate of authority from the United States secretary of the treasury.

E. Facsimiles or copies of Proposal Bond will not be acceptable. Submit fully executed originals of required documents.

1.6 STATUTORY PERFORMANCE BOND AND STATUTORY LABOR AND MATERIAL PAYMENT BOND

A. A Statutory Performance Bond and a Statutory Labor and Material Payment Bond will be required of the successful proposer and shall be executed by a surety company acceptable to the Owner and authorized to do business in the State of Texas. Each bond shall be in an amount equal to one hundred percent (100%) of the contract price. The Performance Bond and the Labor and Material Payment Bond may be in one or separate instruments in accord with local law and are to be delivered to the Owner no later than ten days after written notification from the Owner of the award of Contract to him. Failure or neglecting to deliver said bonds, as specified, shall be considered as having abandoned the contract and the proposal security will be retained as liquidated damages.

B. Bonds shall be executed by a Surety Company that is:
   1. Approved by the school district, and duly authorized and admitted to do business in the State of Texas as determined by the State Board of Insurance.

2. Listed by the United States Department of the Treasury in that issue of the "Federal Register" covering the date on which the bond was executed and the date that Surety Company has obtained reinsurance, if applicable, from a reinsurer that is authorized and admitted as a reinsurer in this state and is the holder of a certificate of authority from the United States secretary of the treasury.

1.7 SUBMITTAL

A. Submit proposals in accordance with the Request for Competitive Sealed Proposals. Enclose proposal in an opaque, sealed envelope. Each CSP shall be properly identified with the CSP Number, CSP Title, Name of Company submitting CSP, and the established time and date to be opened.

B. Preparation of Proposals: Proposals shall be submitted on unaltered proposal forms furnished by Eagle Mountain-Saginaw ISD. Fill in all blank spaces. If there are entries (blank spaces) on the proposal form which do not apply to a particular proposer, these entries shall be marked "N.A." (Not Applicable) by the proposer. No proposals will be considered that are amended or are qualified with conditional clauses, alterations, items not called for in the proposal, or irregularities of any kind which, in the Owner's opinion, may disqualify the proposer.

C. Reference DOCUMENT 00 43 93 - PROPOSAL SUBMITTAL CHECKLIST for Proposal document submittal requirements.
1. Part "A" - February 7, 2019, prior to 2:00pm CST
   a. SECTION 00 42 00 - PART "A" PROPOSAL FORM - BASE PROPOSAL
   b. Cashier's Check, Certified Check, or Bid Bond for no less than 5% of the largest possible total for the proposal submitted.
   c. Required Forms (A through L), duly filled out and signed.
2. Part "B" - February 7, 2019, prior to 2:00pm CST
   a. SECTION 00 43 00 - PART "B" PROPOSAL FORM - QUALIFICATIONS
   b. Contractor's Qualification Statement AIA Document 305
   c. Contractor may include any other information that responds to the Selection Criteria listed.

1.8 COMPETITIVE SEALED PROPOSAL EVALUATION AND RANKING PROCEDURES

A. The following procedures shall be used to evaluate and recommend a construction contractor for selection by the School District through the use of Competitive Sealed Proposals, as authorized in Texas Government Code 2269.

B. Proposal Evaluation Committee
1. For each construction project utilizing the Competitive Sealed Proposal method of procurement, the School Board shall convene a Proposal Evaluation Committee (Committee) that may be comprised from of the following individuals:
   a. School Board Members
   b. School Administration
   c. District's Financial Officer or Consultant
   d. Staff
   e. Project Architect
   f. Project Engineer
   g. Program Manager

C. Proposal Evaluation Committee Function
   1. The Committee shall perform an evaluation of all submitted Proposals and shall recommend an order of selection ranking of all Proposers to the School Board. The following procedures shall be used by the Committee in the evaluation process:
      a. As soon as possible following the public opening of Proposals, the Committee shall meet to conduct a preliminary examination of each Proposal for compliance with the published requirements.
      b. The Committee shall conduct thorough discussions and evaluations of all Proposals.
      c. Within forty-five (45) days after publicly opening the Proposals, the Committee shall produce a ranking of Proposers in the order of the best value to the School District.
      d. The recommended ranking shall be based on the data furnished by the Proposers in response to the request for Competitive Sealed Proposals. The following is a list of rating categories and values for each category. To provide the best value to the School District, these categories and values may be revised by the Committee based on the project type and conditions at the time Proposals are requested. Unless modified by addendum prior to opening of the Proposals, the following listing of categories and values shall be utilized by the Committee:

RATING CATEGORY	VALUE
Proposed Construction Contract Amount	50.00
Proposed Construction Contract Time	5.00
TAB 2 – Schedule	10.00
TAB 3 – Key Project Personnel	10.00
TAB 4 - Past Relationship/History with District	5.00
TAB 5 – Project Experience	10.00
TAB 6 - Financial Background	5.00
TAB 7 - Claims and Suits	3.00
TAB 8 - Quality Control Program	2.00
TOTAL OF WEIGHTED VALUE	100.00

D. General Evaluation Procedures
   1. Proposed Construction Contract Amount and Proposed Construction Contract Time will be rated using mathematical processes described below. Each of the other listed rating categories shall be evaluated on a scale of zero to ten. Each rating category response will be evaluated and the Committee shall produce a single evaluation determination in each category for each Proposal received.

E. Proposed Construction Contract Amount Evaluation
   1. This evaluation ranking shall be based on a value of ten (10) assigned to the lowest proposed amount. Each successive Proposer's contract amount shall be scored as follows; Low Proposer amount divided by the next low Proposer amount, and multiply that figure by 10 equals the score for that Proposer.
   2. These resulting ratings are then multiplied by the value of this rating category, producing the construction contract amount score for each Proposer.

F. Proposed Construction Contract Time Evaluation
   1. The evaluation ranking of Proposed Construction Contract Time shall be accomplished by the same mathematical process as the Contract Amount Evaluation. The value of ten (10) is assigned to the shortest Proposed Construction Contract Time.

2. These resulting ratings are then multiplied by the value of this rating category, producing the construction contract amount score for each Proposer.

G. Scoring
1. Proposers may receive equal rating in the Proposed Construction Contract Amount or the Proposed Construction Contract Time category if their proposed amounts in these categories are identical.
2. With the exception of the Proposed Construction Contract Amount and Proposed Construction Contract Time ratings, all other category rating determinations among Proposers may receive identical values if, in the opinion of the Committee, the qualification data provided by Proposers are determined to be equal for a selected category.
3. Upon determining a rating for each category, a categorical score for each Proposer shall be calculated by multiplying the category value by the Committee determined rating.
4. The total score for a Proposer shall be determined by adding the scores received for each category. The maximum score attainable for all categories shall be one thousand (1,000).
5. The Committee shall produce a tabulation of scores, which identifies the Proposers their Proposed Construction Contract Amounts, their Proposed Construction Contract Times, and their individual total scores.

1.9 ESTIMATED BUDGET

A. The estimated budget for this project is: $5,000,000.00

1.10 WAGE RATES

A. Reference DOCUMENT 00 73 46 - PREVAILING WAGE RATES.

1.11 SELECTION CRITERIA

A. Reference DOCUMENT 00 22 16 - EAGLE MOUNTAIN-SAGINAW ISD SUPPLEMENTARY INSTRUCTIONS TO PROPOSERS, SECTION 2 – CSP EVALUATION CRITERIA.

1.12 MODIFICATION AND WITHDRAWAL

A. No proposal may be changed, amended or modified after submittal. Proposers may withdraw proposals prior to proposal opening.

1.13 EXECUTION OF CONTRACT

A. The Owner reserves the right to accept any proposal, to reject any and all proposals, or to negotiate contract terms with the various proposers, when such is deemed by the Owner to be in his best interest.

B. Notwithstanding delays in the preparation and execution of the formal contract agreement, each proposer shall be prepared, upon written notice of proposal acceptance, to commence work on or before a date stipulated in an official written order of the Owner to proceed.

C. The accepted proposer shall assist and cooperate with the Owner in preparing the formal contract agreement, and within 5 days following its presentation shall execute same and return it to the Owner.

D. Form for the contract agreement will be the revised AIA Document A101-2017, A101-2017 Exhibit A, and the A201-2017 found in the Project Manual.

1.14 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. The "Notice-to-Proceed" issued by the Owner and the Substantial Completion dates shall be as stated below for each area of work noted.
   1. While school is in session, access to buildings shall be only during nights and weekends. School maintenance staff summer hours are 7:30am - 5:30pm Monday through Thursday. Any work required outside of these hours will be required to be coordinated with the Owner.
   2. Cafeterias/Kitchens at Bryson ES, Elkins ES, and Eagle Mountain ES, Fire Sprinkler System at Bryson ES, and Carpet Replacement at Gilliland ES:
      a. Notice-to-Proceed: Construction work in, and access to, these areas shall be available June 3, 2019, with full access to designated construction areas as coordinated with Owner.
      b. Substantial Completion Date: August 7, 2019
   3. Remainder of Work at Bryson ES:
      a. Notice -to-Proceed: Construction work in, and access to, these areas shall begin upon "Notice-to-Proceed" issued by the Owner on approximately March 4, 2019, with full access to designated construction areas as coordinated with Owner.
      b. Substantial Completion Date: Substantial Completion Date shall be established as the number of consecutive calendar days as set out on the proposal form from the "Notice-to-proceed" date issued by the Owner.

C. Failure of the Contractor to complete the Work by the contract date will result in damages being sustained by the Owner. Such damages are, and will continue to be, impracticable and extremely difficult to determine. Due consideration will be given to delays falling within 8.3 of the General Conditions.

D. The Contractor will pay the Owner the amount indicated on the Proposal Form and in the General Conditions for each calendar day of delay in finishing the Work in excess of time specified for Substantial Completion and for Final Completion, plus authorized time extensions. Execution of the Contract under these specifications shall constitute agreement by the Owner and Contractor that the amount indicated is the minimum value of the costs and actual damage caused by failure of the Contractor to reach Substantial Completion and Final Completion of the Work within the allotted time, that such sum is Liquidated Damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

1.15 SALES TAX EXEMPTION

A. The Owner qualifies for exemption from State and Local Sales Taxes as set forth in the modified General Conditions.

DOCUMENT 00 22 16

EAGLE MOUNTAIN-SAGINAW ISD
SUPPLEMENTARY INSTRUCTIONS TO PROPOSERS

In submitting a CSP, Proposer understands and agrees to be bound by the following terms and conditions which shall be incorporated into any future contracts, agreements, or purchase orders relating to this CSP between the Contractor and the Eagle Mountain-Saginaw Independent School District. By submitting a CSP, each proposer agrees to waive any claim it has or may have against the Eagle Mountain-Saginaw Independent School District arising out of or in connection with the administration, evaluation, or recommendation of any CSP; waiver of any requirements under the CSP documents; acceptance or rejection of any CSPs; and award of Contracts, if any.

SECTION 1 – GENERAL INSTRUCTIONS

1.1 To be considered a responsive CSP, all pages requiring signature, the Cover Page, and any/all attachments, must be completed with all requested information, **signed** and returned **sealed** in an envelope or other appropriate package adequate to conceal and contain the contents prior to the CSP date and time. Each CSP shall be placed in a separate envelope and properly identified with the CSP Number, CSP Title, Name of Company submitting CSP, and the established time and date to be opened.

1.2 The Proposer is strongly encouraged to read the entire CSP document prior to submitting response. Failure to provide the information requested in its entirety may be grounds for disqualification of CSP.

1.3 If any exceptions are taken to any portion of this CSP, the Proposer must clearly indicate the exception taken and include a full explanation on the Deviation/Compliance Form or as a separate attachment to the CSP. The failure to identify exceptions or proposed changes will constitute acceptance by the Supplier of the CSP as proposed by the District. The District reserves the right to reject a CSP containing exceptions, additions, qualifications, or conditions.

1.4 The CSP response **must be signed** by an individual authorized to contractually bind the company submitting the CSP. A failure to sign the CSP will cause it to be rejected as non-responsive. CSPs must give full firm name and address of proposer. Person signing CSP should show title or authority to bind his/her firm in a contract.

1.5 CSPs must be received in the Purchasing Department office **prior to** the hour and date specified in this document or any subsequent Addenda. No other published dates will be binding. **LATE CSPS WILL NOT BE ACCEPTED.** No oral, telegraphic, telephonic, electronic mail, or facsimile transmitted CSPs will be considered. The clock located in the EMSISD Purchasing Department is considered the official time for receiving and opening CSPs.

1.6 Sealed CSPs shall be mailed or otherwise delivered to the following address:

Eagle Mountain-Saginaw Independent School District
Attention: Lucia Cieszlak
Director of Purchasing
1200 Old Decatur Rd., Business Building #6
Fort Worth, Texas 76179

1.7 All questions regarding this invitation **must be submitted in writing** (email preferred) to Lucia Cieszlak (lcieszlak@ems-isd.net). Requests for information/interpretation must be received on or before seven (7) calendar days prior to the opening date. Only questions answered by formal written addenda will be binding.

1.8 Addenda will be posted to the Eagle Mountain-Saginaw ISD web page. You may obtain the addenda from our internet/web site address at www.emsisd.com by choosing "Departments," then "Purchasing," then "Bid Opportunities." It is the responsibility of each proposer to obtain all addenda that pertains to this CSP. **Proposers who submit a CSP without acknowledging receipt of all addenda issued may be deemed to have submitted a CSP not responsive to this solicitation.** Failure to receive such addenda does not relieve proposer from any obligation under the CSP submitted. All formal written addenda become a part of the CSP documents. Proposers shall acknowledge receipt of all addenda in the CSP Response Form.

1.9 CSPs must remain open for acceptance for a period of **sixty (60) days** subsequent to the opening of CSPs, unless otherwise indicated, to allow time for the offer(s) to be evaluated and Board of Trustees action, if required.

1.10 The successful proposer(s) will be notified in writing (manifested by an award letter or properly executed purchase order) after review and acceptance by the Eagle Mountain-Saginaw ISD.

1.11 All Proposers must execute the forms enclosed (or otherwise requested herein) for the CSP to be considered responsive. The name of the company representative on these forms should be the same. All supplemental information required by the CSP Form must be included with the CSP. Failure to provide complete and accurate information may disqualify the proposer.

1.12 On August 7, 2015, the Texas Ethics Commission adopted updated Forms CIS and CIQ as required by H.B. 23, 84TH Leg., Regular Session, which becomes effective September 1, 2015. Failure to abide by these new statutory requirements can result in possible criminal penalties. Vendors that do business with a school district are required to file a questionnaire to identify any potential conflicts of interest. The CONFLICT OF INTEREST QUESTIONNAIRE can be downloaded from the District internet/web address at http://www.emsisd.com/Page/344 or the Texas Ethics Commission web address at https://www.ethics.state.tx.us/filinginfo/conflict_forms.htm.
Note: The Eagle Mountain-Saginaw Independent School District will not provide any further interpretation or information regarding these new requirements under House Bill No. 23.

1.13 In 2015, the Texas Legislature adopted House Bill 1295 – Certificate of Interested Parties. EM-S ISD may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to EM-S ISD at the time the business entity submits the signed contract. Additional information is available on the Texas Ethics Commission website at https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm. Use the CSP number as the "Contract ID number" and the title of the CSP for the "Description of Goods and Services."

1.14 Pursuant to Chapter 2270 of the Texas Government Code, Chapter 808, paragraph 227.001, the Proposer verifies that it (1) does not boycott Israel and (2) will not boycott Israel during the term of this contract or any extensions thereto. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli controlled territory, but does not include an action made for ordinary business purposes.

1.15 The Proposer verifies that neither the company, nor any subsidiaries, nor entities under common control, are included in or identified on a list maintained by the Texas Comptroller's Office as a "terrorist organization".

1.16 It is the intent of the Eagle Mountain-Saginaw Independent School District to foster utilization of historically underutilized businesses (HUBS) including Disadvantaged/Minority/Women-Owned Business Enterprises in its procurement activities. The District is particularly interested in receiving CSPs directly from HUBS or from joint ventures involving HUB representation.

1.17 It is the policy of the Eagle Mountain-Saginaw Independent School District not to discriminate on the basis of sex, disability, race, color, or national origin in its educational programs and/or activities, nor in its employment practices.

1.18 In order to ensure the integrity of the selection process, Proposer's employees, officers, agents, or other representatives shall not lobby or attempt to influence a vote or recommendation related to the Proposer's response, directly or indirectly, through any contact with school board members or other district officials from the date this CSP is released until the award.

1.19 This CSP is subject to cancellation by the District if any person significantly involved in initiating, negotiating, securing, drafting, or creating the offer on behalf of Eagle Mountain-Saginaw Independent School District, is at any time while the CSP is in effect, an employee of any other party to the CSP in any capacity or a consultant to any other party of the CSP with respect to the subject matter of the CSP.

1.20 Any board member who has any substantial interest, either direct or indirect, in any business entity seeking to contract with the District, shall, before any vote or decision on any matter involving the business entity, file an affidavit stating the nature and extent of interest and shall abstain from any participation in the matter. This is not required if the vote or decision will not have any special effect on the entity other than its effect on the public. However, if a majority of the governing body are also required to file, and do file similar affidavits, then the member is not required to abstain from further participation. Vernon's Texas Codes Annotated, Local Government Code, Ch. 171.

1.21 Contractor (owners, officers, employees, volunteers, etc.) may not work on district property where students may or may not be present when they have charges pending, have been convicted, received probation or deferred adjudication for the following:

A. Any offense against a child
B. Any sex offense
C. Any crimes against persons involving weapons or violence
D. Any felony offense involving controlled substances
E. Any felony offense against property
F. Any other offense the District believes might compromise the safety of students, staff, or property

1.22 It is the responsibility of the Contractor to comply with Senate Bill 9 – Fingerprinting-based criminal background checks. Upon request, all contractors, subcontractors and their employees must submit to the Eagle Mountain-Saginaw ISD, proof of a satisfactory criminal record history of all individuals working on District property through background checks conducted as required by Senate Bill 9. The criminal record history must be obtained by the successful proposer before any work is performed. The information regarding the requirements for conducting a criminal records check is posted on The Texas Department of Public Safety's website, www.txdps.state.tx.us by clicking open Crime Records.

1.23 Use or possession of weapons, fire arms, tobacco, alcohol beverages, controlled substances, and/or drugs, even in vehicles, is strictly prohibited on school district property. Any harassment of employees, students, or volunteers is also strictly prohibited.

1.24 Contractors, subcontractors, and their employees who perform work inside the EMSISD facilities are hereby notified that our buildings may contain asbestos containing materials. This notification is required by both the State of Texas Department of State Health Services and the Federal EPA Asbestos regulations. These guidelines cover both EMSISD's responsibilities and the Employer's responsibility to their employees. As a Contractor it is your responsibility to check each building prior to performing any work in that facility. These building materials may include but are not limited to: ceiling tile, floor tile and mastic, sheetrock, tape and bed compound, thermal pipe insulation, spray-on ceiling material, calks, and roofing products. As there have been numerous asbestos containing products manufactured over the years, you must check each building's Asbestos Management Plan. This plan is normally kept in the main office. Check with the school secretary and she will allow you to look at it. It is the vendor's responsibility to notify all employees working for them that EMSISD facilities may contain asbestos and where their employees may find the facility's Asbestos Management Plan. Again, it is the Contractor’s responsibility to check the Asbestos Management Plan for each facility prior to working in the facility and then to notify their employees performing the actual work. The information is found in section eight (8) for all asbestos that are remaining in the building. If after looking in the Asbestos Management Plan you are uncertain about whether the area you will be working in contains asbestos or not, please contact Clete Welch, Chief Operating Officer, at 817-306-0864 for further assistance.

SECTION 2 – CSP REQUIREMENTS AND CONDITIONS

2.1 WITHDRAWING CSP

2.1.1 CSPs deposited with the Eagle Mountain-Saginaw Independent School District (hereinafter called "EMSISD" or "District") can be withdrawn, upon written request, prior to the time set for opening CSPs. A CSP may not be withdrawn after the CSPs have been opened, and the Proposer, by submitting a CSP, warrants and guarantees that the CSP has been carefully reviewed and checked and that it is in all things true and accurate and free of mistakes.

2.1.2 CSPs cannot be altered or amended after opening time. Any alterations made before opening time **must** be initialed by proposer or his/her authorized agent.

2.2 CONSIDERATION OF CSP

2.2.1 **CSPs must be signed, sealed and delivered to the Eagle Mountain-Saginaw Independent School District Purchasing Department office PRIOR TO the CSP due date and time. Unsigned, unsealed or late CSPs will not be considered.** After CSPs are opened and publicly read aloud, the CSPs will be tabulated for comparison on the basis of the CSP prices and quantities shown in the CSP.

2.2.2 The Eagle Mountain-Saginaw Independent School District Board of Trustees reserves the right to reject any or all CSPs, to waive technicalities, and to re-advertise for new CSPs, or proceed to do the work otherwise in the best interests of the District.

2.2.3 Cash discounts with terms less than thirty (30) days will not be considered in the awarding of CSPs and will be tabulated as "net."

2.2.4 CSPs received after the date and time specified **will not** be considered. The Purchasing Department will notify those firms submitting late CSPs and will hold documents for pick-up for five (5) business days following late CSP notification. **All late CSPs which are not picked up by the Proposer within five business days will be discarded.**

2.3 IRREGULAR CSP

2.3.1 CSPs will be considered irregular if they show any omissions, alterations of form, additions, or conditions not called for, unauthorized alternate CSPs, failure to return all forms and copies, or irregularities of any kind. However, the District reserves the right to waive any irregularities and to make the award in the best interests of the District.

2.4 REJECTION OF CSP

2.4.1 The District reserves the right to reject any or all CSPs, and all CSPs submitted are subject to this reservation. CSPs may be rejected, among other reasons, for any of the following specific reasons:

A. CSP received after the time limit for receiving proposals as stated in the advertisement.
B. CSP containing any irregularities.
C. Unbalanced value of any items.

D. Improper or insufficient CSP guaranty, if required.
E. Where the Proposer, any Sub-contractor or Supplier, or the surety on any bond given, or to be given, is in litigation with the District or where such litigation is contemplated or imminent, in the sole opinion of the District.

2.5 DISQUALIFICATION OF PROPOSERS

2.5.1 Proposers may be disqualified and their CSPs not considered, among other reasons, for any of the following specific reasons:

A. Reason for believing collusion exists among the Proposers.
B. Reasonable grounds for believing that any Proposer is interested in more than one CSP for the work contemplated.
C. Where the Proposer, any Sub-contractor or Supplier, or the surety on any bond given, or to be given, is in litigation with the District or where such litigation is contemplated or imminent, in the sole opinion of the District.
D. The Proposer being in arrears on any existing Contract/Purchase Order or having defaulted on a previous Purchase Order.
E. Lack of competency as revealed by pertinent factors, including but not necessarily limited to, experience and equipment, financial statement and questionnaires.
F. Uncompleted work that in the judgment of the District will prevent or hinder the prompt completion of additional work if awarded.
G. Where the Proposer has failed to perform in a satisfactory manner on a previous Purchase Order/Contract.

2.6 CONFIDENTIAL OR PROPRIETARY MARKINGS

2.6.1 Any portion of the CSP that Proposer considers confidential or proprietary information, or to contain trade secrets of Proposer, must be marked accordingly. This marking must be explicit as to the designated information. This designation may not necessarily guarantee the non-release of the information under the Public Information Act or as otherwise required by law, but does provide the District with a means to review the issues thoroughly and, if justified, request an opinion by the Attorney General's office prior to releasing any information requested under the Public Information Act.

SECTION 3 – GENERAL TERMS AND CONDITIONS

3.1 TAX EXEMPT STATUS

3.1.1 The Eagle Mountain-Saginaw Independent School District is exempt from Federal Excise Tax. **DO NOT INCLUDE TAX IN CSP PRICES.** Excise Tax Exemption Certificate will be furnished upon request. EMSISD Federal ID Number is 75-6004855.

3.2 RIGHTS TO INSPECT AND AUDIT

3.2.1 The Contractor (and Contractor's suppliers, vendors, sub-contractors, insurance agents, and other agents) shall maintain and the District shall have the right to examine records, documents, books, accounting procedures and practices and any other supporting evidence deemed necessary by the District to substantiate compliance with the terms of this agreement. Such right of examination shall include reasonable access to and cooperation by all Contractors personnel who have worked on or have knowledge related to the performance of this CSP. Proprietary/Trade Secret information pertaining to this CSP may not be withheld from the District or its Authorized Representative.

3.3 CONTRACTOR RESPONSIBILITIES

3.3.1 The Contractor shall be fully responsible for the quality and accuracy of any and all Work performed in conjunction with this CSP. Neither acceptance of such Work by the District, nor payment therefore, shall relieve the Contractor of this responsibility. If and when applicable, the Contractor shall complete all services in conformity with professional standards, and shall provide qualified personnel to meet agreed upon schedules.

3.4 NON-APPROPRIATION CLAUSE

3.4.1 If for a fiscal year (September 1 through August 31) of this contract, the Board of Trustees, for any reason, fails to appropriate funds for these goods/services, the District will notify the Contractor immediately and will no longer be obligated under the contract.

3.5 GRATUITIES

3.5.1 The District may, by written notice to the Contractor, cancel this CSP without liability to Contractor if it is determined by the District that gratuities, in the form of entertainment, compensation, gifts, or otherwise, were offered or given by the Contractor, or any agent or representative of the Contractor, to any Board Member, officer, or employee of the Eagle Mountain-Saginaw Independent School District with a view toward securing a CSP or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such an agreement.

3.6 JURISDICTION

3.6.1 The Purchase Order(s) resulting from this CSP shall be enforceable in Tarrant County, Texas, and if legal action is necessary by either party with respect to the enforcement of any and all of its terms and conditions, exclusive venue for same shall lie in state courts in Tarrant County, Texas.

3.7 INDEMNIFICATION AND HOLD HARMLESS

3.7.1 The Contractor shall defend, indemnify, and hold harmless the Eagle Mountain-Saginaw Independent School District, all of its officers, agents and employees from and against all claims, actions, suits, demands, proceedings, costs, damages, and liabilities, arising out of, connected with, or resulting from any acts or omissions of Contractor or any agent, employee, sub-contractor, or supplier of Contractor in the execution or performance of this CSP

3.8 PREVAILING WAGE RATES

3.8.1 In executing the Work under the Contract Documents, Contractor shall comply with all applicable state and federal laws, including but not limited to, laws concerned with labor, equal employment opportunity, safety and minimum wages.

SECTION 4 - CSP EVALUATION CRITERIA

4.1.1 In evaluating CSPs submitted and per Government Code 2269.055, the following considerations may be taken into account in determining the award.

4.1.2 In determining the Selected Offeror, the Owner will evaluate the information derived from the Offeror's (Contractor's) Qualification Statement (AIA Document A305) required herein, the information submitted on the Proposal Form, and other selection criteria including the following Evaluation Criteria:

RATING CATEGORY	VALUE
Proposed Construction Contract Amount	50.00
Proposed Construction Contract Time	5.00
TAB 2 – Schedule	10.00
TAB 3 – Key Project Personnel	10.00
TAB 4 - Past Relationship/History with District	5.00
TAB 5 – Project Experience	10.00
TAB 6 - Financial Background	5.00
TAB 7 - Claims and Suits	3.00
TAB 8 - Quality Control Program	2.00
TOTAL OF WEIGHTED VALUE	100.00

DOCUMENT 00 42 00

PART "A" PROPOSAL FORM - BASE PROPOSAL

BRYSON ES, ELKINS ES, EAGLE MOUNTAIN ES &
BOSWELL HS ADDITIONS AND RENOVATIONS
EAGLE MOUNTAIN-SAGINAW ISD
FORT WORTH, TEXAS

PROPOSAL OF: _____
(Name) (Date)

TO: Lucia Cieszlak
Director of Purchasing
Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Rd., **Business Building #6**
Fort Worth, Texas 76179

Dear Madam:

Having examined the drawings, project manual, and related documents and having inspected the site of proposed Work, I (we) agree to furnish all labor, materials, and to perform all work described in the specifications and shown on the drawings for the sum of:

BASE PROPOSAL: For complete construction, including General, Mechanical, Plumbing, and Electrical Work, for the sum of:

_____ DOLLARS

($_____).

NOTE: Amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

ALLOWANCES: The above base proposal includes all allowances listed in *Section 01 21 00 - Allowances.*

The undersigned agrees, if this proposal is accepted, to commence work of the Cafeterias/Kitchens at Bryson ES, Elkins ES, and Eagle Mountain ES, Fire Sprinkler System at Bryson ES, and Carpet Replacement at Gilliland ES on or before a date to be established in the written "Notice-to-Proceed" of the Owner, approximately June 3, 2019, and to attain substantial completion of all Work August 7, 2019, subject to extensions of time as described in Article 8.3 of the General Conditions.

The undersigned agrees, if this proposal is accepted, to commence work of the remainder of Work at Bryson ES on or before a date to be established in the written "Notice-to-Proceed" of the Owner, approximately March 4, 2019, and to attain substantial completion of all Work within _____ consecutive calendar days, subject to extensions of time as described in Article 8.3 of the General Conditions.

The undersigned further agrees that, from the compensation otherwise to be paid, the Owner may retain the sum of $1,500.00 (per campus) for each calendar day after the Substantial Completion date that the Work remains incomplete and the sum of $1,500.00 for each calendar day after the Final Completion date that the Work remains incomplete (per campus), which sum is agreed upon as the proper measure of liquidated damages which the Owner will sustain per diem by the failure of the undersigned to complete the Work at the time stipulated in the contract. Damages for failure to achieve Substantial Completion and failure to achieve Final Completion may run concurrently. These sums are not to be construed in any sense a penalty.

I (we) acknowledge receipt of the following addenda:

Addendum No. 1 Dated _____ Addendum No. 4 Dated _____

Addendum No. 2 Dated _____ Addendum No. 5 Dated _____

Addendum No. 3 Dated _____ Addendum No. 6 Dated _____

Upon receipt of notice of acceptance of this proposal within 60 days after the opening of proposals, I (we) agree to execute formal contract forms, acceptable surety bonds, and required insurance certificates within 10 days of the Notice of Award of the Contract.

Should I (we) fail to execute and deliver the Contract, along with the satisfactory surety bonds and insurance certification within the time set forth, the proposal security, attached hereto without endorsement, in the sum of:

_____ DOLLARS ($_____).

shall become the property of Eagle Mountain-Saginaw Independent School District as liquidated damages for the delay caused and the additional work required.

_____
Respectfully submitted, (Signature)

_____
By (Please Print or Type)

_____
Title

_____
Contractor

_____
Business Address

_____
Telephone Number FAX Number

Indicate whether - Individual
Partnership
Corporation

ATTEST:

_____
Secretary

FORM A

CSP RESPONSE FORM

The undersigned, in submitting this CSP and endorsement of same, represents that he/she is authorized to obligate his/her firm, that he/she is an equal opportunity employer and will not discriminate with regard to race, color, religion, sex, national origin, age or disability unrelated to job performance of this CSP; that he/she will abide by all the policies and procedures of EM-S ISD; and that he/she has read this entire CSP package, is aware of the covenants contained herein and will abide by and adhere to the expressed requirements in ***ALL*** sections of this CSP.

Failure to manually sign this CSP Response Form will be reason for the CSP to be rejected.

SUBMITTED BY:

Firm: _____
(OFFICIAL Firm Name)

MUST BE SIGNED IN INK TO BE CONSIDERED RESPONSIVE

By: _____
(Original Signature)

Name: _____
(Typed or Printed Name)

Title: _____ _____
(Type or Printed Title) (Date)

Contact Representative: _____

Address: _____

City/ST/Zip: _____

Phone #: _____ Fax #: _____

Email: _____

Taxpayer Identification #: _____

NOTE: Submit copy of Proposer's current W-9 Form

Prompt Payment Discount: _____ % _____ Days

I hereby acknowledge receipt of the following addenda which have been issued and incorporated into the CSP Document. (*Please initial in ink beside each addenda received. If none received, leave blank*)

Addendum No. 1 _____ Addendum No. 3 _____

Addendum No. 2 _____ Addendum No. 4 _____

FORM B

DEVIATION/COMPLIANCE SIGNATURE FORM

If the undersigned Firm intends to deviate from the Specifications listed in this CSP document, all such deviations must be listed on this page, with complete and detailed conditions and information included or attached. The District will consider any deviations in its CSP award decisions, and the District reserves the right to accept or reject any CSP based upon any deviations indicated below or in any attachments or inclusions.

In the absence of any deviation entry on this form, the Firm assures the District of his/her full compliance with the Terms and Conditions, Specifications, and all other information contained in this CSP document.

☐ No Deviation

☐ Yes Deviations

Firm's Name: _____

Authorized Company Official's Name: _____
(Typed or printed)

Title of Authorized Representative: _____
(Typed or printed)

Signature of Authorized Company Official: _____

Date Signed: _____

If yes is checked, please list below. Attach additional sheet(s) if needed.

_____

_____

_____

_____

_____

_____

_____

_____

FORM C

NON-COLLUSION STATEMENT

"The undersigned affirms that he/she is duly authorized to execute this CSP, that this company, corporation, firm, partnership or individual has not prepared this CSP in collusion with any other proposer, and that the contents of this CSP as to prices, terms or conditions of said CSP have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this CSP."

Firm's Name: _____

Authorized Company Official's Name: _____
(Typed or printed)

Title of Authorized Representative: _____
(Typed or printed)

Signature of Authorized Company Official: _____

Date Signed: _____

Firm hereby assigns to purchaser any and all claims for overcharges associated with this CSP which arise under the antitrust laws of the United States, 15 USCA Section 1 and which arise under the antitrust laws of the State of Texas, Business and Commerce Code, Section 15.01.

FORM D

CRIMINAL BACKGROUND CHECK AND FELONY CONVICTION NOTIFICATION

(a) CRIMINAL BACKGROUND CHECK

Firm will obtain history record information that relates to an employee, applicant for employment, or agent of the Firm if the employee, applicant, or agent has or will have continuing duties related to the contracted services; and the duties are or will be performed on school property or at another location where students are regularly present. The Firm certifies to the EMSISD before beginning work and at no less than an annual basis thereafter that criminal history record information has been obtained. Firm shall assume all expenses associated with the background checks, and shall immediately remove any employee or agent who was convicted of a felony, or misdemeanor involving moral turpitude, as defined by Texas law, from EMSISD's property or other location where students are regularly present. EMSISD shall be the final decider of what constitutes a "location where students are regularly present." Firm's violation of this section shall constitute a material breach and default.

(b) FELONY CONVICTION NOTIFICATION

Texas Education Code, Section 44.034, Notification of Criminal History, Subsection (a), states, "a person or business entity that enters into a contract with a school district must give advance notice to the District if the person or owner or operator of the business entity has been convicted of a felony." The notice must include a general description of the conduct resulting in the conviction of a felony.

Subsection (b) states, "a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction." The district must compensate the person or business entity for services performed before the termination of the contract.

THE FELONY CONVICTION NOTICE IS NOT REQUIRED OF A PUBLICLY-HELD CORPORATION.

I, the undersigned agent for the firm named below, certify that the information concerning criminal background check and notification of felony convictions has been reviewed by me, the following information furnished is true to the best of my knowledge, and I acknowledge compliance with this section.

Firm's Name: _____

Authorized Company Official's Name: _____

(please print clearly or type)

A. My firm is a publicly-held corporation; therefore, this reporting requirement is not applicable:

Signature of Company Official: _____ Date: _____

B. My firm is not owned nor operated by anyone who has been convicted of a felony.

Signature of Company Official: _____ Date: _____

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony:

Name of Felon(s): _____

_____

Details of Conviction(s): _____

_____

Signature of Company Official: Date: _____

FORM D – CONTINUES ON NEXT PAGE …

Contractor is responsible for the performance of the persons, employees and/or sub-contractors that the Contractor assigns to provide services for the Eagle Mountain-Saginaw ISD pursuant to this CSP on any and all Eagle Mountain- Saginaw ISD campuses or facilities. Contractor will not assign individuals to provide services at an Eagle Mountain- Saginaw ISD campus or facility who have a history of violent, unacceptable, or grossly negligent behavior or who have a felony conviction, without the prior written consent of the Eagle Mountain-Saginaw ISD Purchasing Department.

FORM E

NONRESIDENT BIDDER'S CERTIFICATION

Texas Government Code Chapter 2252 relates to bids by nonresident contractors. The pertinent portions of the Act are as follows:

Section 2252.001(3)

"Nonresident bidder" means a bidder who is not a resident.

Section 2252.001(4)

"Resident bidder" means a bidder whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

Section 2252.002

A governmental entity may not award a governmental contract to a nonresident bidder unless the nonresident underbids the lowest bid submitted by a responsible resident bidder by an amount that is not less than the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in the state in which the nonresident's principal place of business is located.

I certify that _____ is a

Resident Bidder of Texas as defined in Texas Government Code Section 2252.001(4)

Signature of Authorized Company Official: _____

Authorized Company Official's Name: _____

I certify that _____ is a

Nonresident Bidder of Texas as defined in Texas Government Code Section 2252.001(3) and our principal place of business is:

City and State: _____

Signature of Authorized Company Official: _____

Authorized Company Official's Name: _____

FORM F

DEBARMENT OR SUSPENSION CERTIFICATION FORM

Non-Federal entities are prohibited from contracting with or making sub-awards under covered transaction to parties that are suspended or debarred or whose principals are suspended or debarred. Covered transactions include procurement of goods or services equal to or in excess of $100,000. Contractors receiving individual awards of $100,000 or more and all sub-recipients must certify that the organizations and its principals are not suspended or debarred.

By submitting this offer and signing this certificate, this Firm:

(1) Certifies that no suspension or debarment is in place, which would preclude receiving a federally funded contract under the Federal OMB, A-102, common rule.

Firm's Name: _____

Authorized Company Official's Name: _____
(Typed or printed)

Title of Authorized Representative: _____
(Typed or printed)

Signature of Authorized Company Official: _____

Date Signed: _____

COMPLIANCE WITH HOUSE BILL 1295

CERTIFICATE OF INTERESTED PARTIES

In 2015, the Texas Legislature adopted House Bill 1295, which added section 2252.908 of the Government Code. The law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency.

The law applies only to a contract of a governmental entity or state agency that either (1) requires an action or vote by the governing body of the entity or agency before the contract may be signed or (2) has a value of at least $1 million. The disclosure requirement applies to a contract entered into on or after January 1, 2016.

A business entity must use the application available on the website of the Texas Ethics Commission (https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm) to enter the required information on Form 1295 and print a copy of the completed form, which will include a certification of filing that will contain a unique certification number. An authorized agent of the business entity must sign the printed copy of the form. The completed Form 1295 with the certification of filing must be filed with the governmental body or state agency with which the business entity is entering into the contract. The governmental entity or state agency must notify the commission, using the commission's filing application, of the receipt of the filed Form 1295 with the certification of filing not later than the 30th day after the date the contract binds all parties to the contract. The commission will post the completed Form 1295 to its website within seven business days after receiving notice from the governmental entity or state agency.

The undersigned acknowledges that if awarded this contract they will comply with the requirements on House Bill 1295.

Firm's Name: _____

Name of Authorized Company Official: _____
(Typed or printed)

Title of Authorized Company Official: _____
(Typed or printed)

Signature of Authorized Company Official: _____

Date Signed: _____

FORM H

CONFLICT OF INTEREST QUESTIONNAIRE - FORM CIQ

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____
Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____
Signature of vendor doing business with the governmental entity Date

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 11/30/2015

FORM I

NOTIFICATION OF HAZARDOUS MATERIALS AFFIDAVIT

STATE OF TEXAS

_____ COUNTY

Before me, undersigned authority on this day personally appeared _____,_____known to me to be the person whose name is subscribed below, who, on oath stated:

"As the appropriate official of the company, contractor, or subcontractor submitting this affidavit in conjunction with a bid submitted to the Eagle Mountain-Saginaw ISD, I acknowledge that this company, contractor, or subcontractor has been notified that copies of the Asbestos Hazard Emergency Response Act (AHERA) for the school(s) where such company, contractor or subcontractor has been contracted to perform work are available at the Eagle Mountain-Saginaw ISD, Fort Worth, Texas. I understand that it is our responsibility to familiarize ourselves with such plans and that it is our responsibility to inform every worker that we use on this project as to the availability of these plans.

We also acknowledge that we will be required to obtain clearance from the Eagle Mountain-Saginaw ISD, prior to executing any work on this project."

Name of Company:_____

By:_____

Title:_____

STATE OF TEXAS

COUNTY OF _____

Sworn to and subscribed before my hand at _____, Texas this the_____day of_____ _____, 20___, A.D.

_____

Notary Public in and for _____ County, Texas

FORM J

COMPLIANCE WITH HOUSE BILL 89 AND SENATE BILL 252

PROHIBITION ON CONTRACTS WITH COMPANIES BOYCOTTING ISRAEL (HB 89)

Pursuant to Chapter 2270 of the Texas Government Code, Chapter 808, paragraph 227.001, the Proposer verifies that it (1) does not boycott Israel and (2) will not boycott Israel during the term of this contract or any extensions thereto. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli controlled territory, but does not include an action made for ordinary business purposes.

PROHIBITION ON CONTRACTS WITH CERTAIN COMPANIES (SB 252)

The Proposer verifies that neither the company, nor any subsidiaries, nor entities under common control, are included in or identified on a list maintained by the Texas Comptroller's Office as a "terrorist organization".

The undersigned acknowledges that if awarded this contract they will comply with the requirements on House Bill 89 and Senate Bill 252 above stated.

Firm's Name: _____

Name of Authorized Company Official: _____
(Typed or printed)

Title of Authorized Company Official: _____
(Typed or printed)

Signature of Authorized Company Official: _____

Date Signed: _____

FORM K

BUSINESS REFERENCES

1. Company Name: _____
   Address: _____
   _____
   _____

   Business Phone: _____ Fax: _____
   Contact Person: _____ Email: _____

   Description of project or work completed: _____
   _____
   _____

2. Company Name: _____
   Address: _____
   _____
   _____

   Business Phone: _____ Fax: _____
   Contact Person: _____ Email: _____

   Description of project or work completed: _____
   _____
   _____

3. Company Name: _____
   Address: _____
   _____
   _____

   Business Phone: _____ Fax: _____
   Contact Person: _____ Email: _____

   Description of project or work completed: _____
   _____
   _____

FORM L

CONTRACTOR DATA FORM

How long has the company been in business? _____

1. For Purchase Orders: ORDERING ADDRESS INFORMATION

Company Name: _____

Address: _____

_____

_____

Business Phone: _____ Fax: _____

Contact Person: _____ Email: _____

Does your company accept orders via email? Yes ☐ No ☐

If yes, what is the ordering email address? _____

2. For Payments: REMITTANCE ADDRESS INFORMATION

Company Name: _____

Address: _____

_____

_____

Business Phone: _____ Fax: _____

Contact Person: _____ Email: _____

3. For Bid Notifications: BID NOTICES ADDRESS INFORMATION

Company Name: _____

Address: _____

_____

_____

Business Phone: _____ Fax: _____

Contact Person: _____ Email: _____

SECTION 00 43 00

PART "B" PROPOSAL FORM - QUALIFICATIONS

BRYSON ES, ELKINS ES, EAGLE MOUNTAIN ES &
BOSWELL HS ADDITIONS AND RENOVATIONS
EAGLE MOUNTAIN-SAGINAW ISD
FORT WORTH, TEXAS

PROPOSAL OF: _____
(Name) (Date)

TO: Lucia Cieszlak
Director of Purchasing
Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Rd., Business Building #6
Fort Worth, Texas 76179

THE CONTRACTOR SHALL PROVIDE THE FOLLOWING INFORMATION IN THE SEQUENCE AND FORMAT PRESCRIBED HEREIN AND AS OUTLINED IN SECTION 00 21 16 - INSTRUCTIONS TO PROPOSERS, PROVIDING ADDITIONAL INFORMATION MAY BE ATTACHED, BUT THE INFORMATION REQUESTED BELOW IS TO BE PROVIDED IN THIS FORMAT AND TABBED AS NOTED.

TAB 1: FIRM INFORMATION

Name of Firm: _____
Address of Principal Office: _____
Phone Number: _____
Fax Number: _____
Email Address and/or Web Address: _____
Form of Business Organization (Corporation, Partnership, Limited Liability Partnership, Individual, Joint Venture, other):_____
Year Founded: _____
Primary individual to contact: _____

TAB 2: SCHEDULE:

The Proposer shall submit a schedule for this project.
State your organization's project plan or proposed approach to this project.
If selected, this proposed schedule shall become part of the Owner - Contractor Agreement, AIA Document A101-2007 under Article 9.1.7.

TAB 3: KEY PROJECT PERSONNEL:

Given the scope and schedule of the project, identify all proposed personnel for this project including but not limited to the Project Manager, Estimator, and Superintendent who would work on the project. Provide a resume and references for each individual. Note current projects on which individual is working including the project name, location, contract amount, percent complete, and the completion date of those projects. Also note the length of tenure with your company (hire date) for each proposed individual. Provide an organizational chart for this project noting whether the individual is On Site or Off Site. This organizational chart shall become part of the Owner-Contractor Agreement, AIA Document A101-2007 under Article 9.1.7. Members of the proposed team, once approved, shall not be changed without prior written approval of the Owner.

TAB 4: PAST RELATIONSHIP/HISTORY WITH DISTRICT:

Provide a list of projects with school district within the last five (5) years in similar scope and size to the project herein.

TAB 5: PROJECT EXPERIENCE:

List all educational projects and all other major projects constructed by your firm within the last five (5) years in similar scope and size to the project herein. For each project provide the name of the project; nature of the project/function of the building; size (square feet); locations; cost; completion date; name and contact person, address and phone number of both the Owner and Architect; and the manner in which your organization was selected (Bid, RFP, CM or other method).

TAB 6: FINANCIAL BACKGROUND:

Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory, and prepaid expenses).

Non-current assets (e.g., net fixed assets, other assets).

Current liabilities (e.g., accounts payable, notes payable (current), accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes).

Non-current liabilities (e.g., notes payable).

Capital accounts and retained earnings (e.g., capital, capital stock, authorized and outstanding shares par value, earned surplus and retained earnings).

Name and address of firm preparing attached financial statement and date thereof.

Is the attached financial statement for the identical organization named under item 1 above? If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent, and subsidiary).

Provide name, address, phone for bank reference.

Surety: Name of bonding company, name and address of agent. State total bonding capacity and total current bonding obligations with and without this project.

Please note that this information will be reviewed by the Owners Financial Officer or Consultant acting in that capacity.

TAB 7: CLAIMS AND SUITS:

List all lawsuits, requested arbitration and mediation with regard to construction contracts in the last ten (10) years.

List all judgments, claims, arbitration proceedings, mediation or suits pending or anticipated against your organization.

If your company has been in business less than ten (10) years then include any former company information if applicable.

TAB 8: QUALITY PROGRAM:

State your organization's overall approach to quality control for this project.

SECTION 00 43 93

PROPOSAL SUBMITTAL CHECKLIST

To be considered a responsive CSP, all pages requiring signature, the Cover Page, and any/all attachments or documents requested, must be completed with all requested information, **SIGNED** and **RETURNED** sealed in an envelope or other appropriate package adequate to conceal and contain the contents prior to the CSP date and time.

Please verify that the documents listed below have been completed, signed, and included in your CSP prior to submittal. **FAILURE TO RETURN THESE DOCUMENTS MAY CAUSE YOUR CSP TO BE REJECTED.**

The following items are to be submitted to Eagle Mountain-Saginaw ISD on Thursday, February 7, 2019, prior to 2:00 p.m. CST.

- ☐ Completed – EM-S ISD - Request for Competitive Sealed Proposals (RFCSP) Cover Sheet (page 1 of 36)
- ☐ Completed - Document 00 42 00 - Part "A" Proposal Form - Base Proposal Form
- ☐ Completed - Bid Bond or Bid Security (Include Base Bid and all Alternates)
- ☐ Completed – CSP Response Form – Form A
- ☐ Completed – Deviation/Compliance – Form B
- ☐ Completed – Non-Collusion Statement – Form C
- ☐ Completed – Criminal Background Check and Felony Conviction Notification – Form D
- ☐ Completed – Nonresident Bidder's Certification – Form E
- ☐ Completed – Debarment or Suspension Certification – Form F
- ☐ Completed – Compliance with House Bill 1295 – Form G
- ☐ Completed – CIQ – Form H
- ☐ Completed – Notification of Hazardous Materials Affidavit – Form I
- ☐ Completed – Compliance with House Bill 89 and Senate Bill 252 – Form J
- ☐ Completed – Business References Form – Form K
- ☐ Completed – Contractor Data Form – Form L
- ☐ Any and all attachments as required in the CSP document
- ☐ W-9
- ☐ Completed - Document 00 43 00 - Part "B" Proposal Form - Qualifications
- ☐ Completed – Contractor's Qualification Statement - AIA Document A305

DOCUMENT 00 31 32

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 LOG OF BORINGS/CONTRACTOR RESPONSIBILITY

A. A copy of the locations and log of borings is bound herein. Subsurface soil data derived from test borings are given only for the convenience of the Contractor, and neither the Owner nor the Architect assumes responsibility for the accuracy of or for the Contractor's interpretation of the data. Contractor is responsible for any conclusions drawn from the boring data and is responsible for the work without extra compensation irrespective of whether or not the subsurface conditions encountered agree with the boring data.

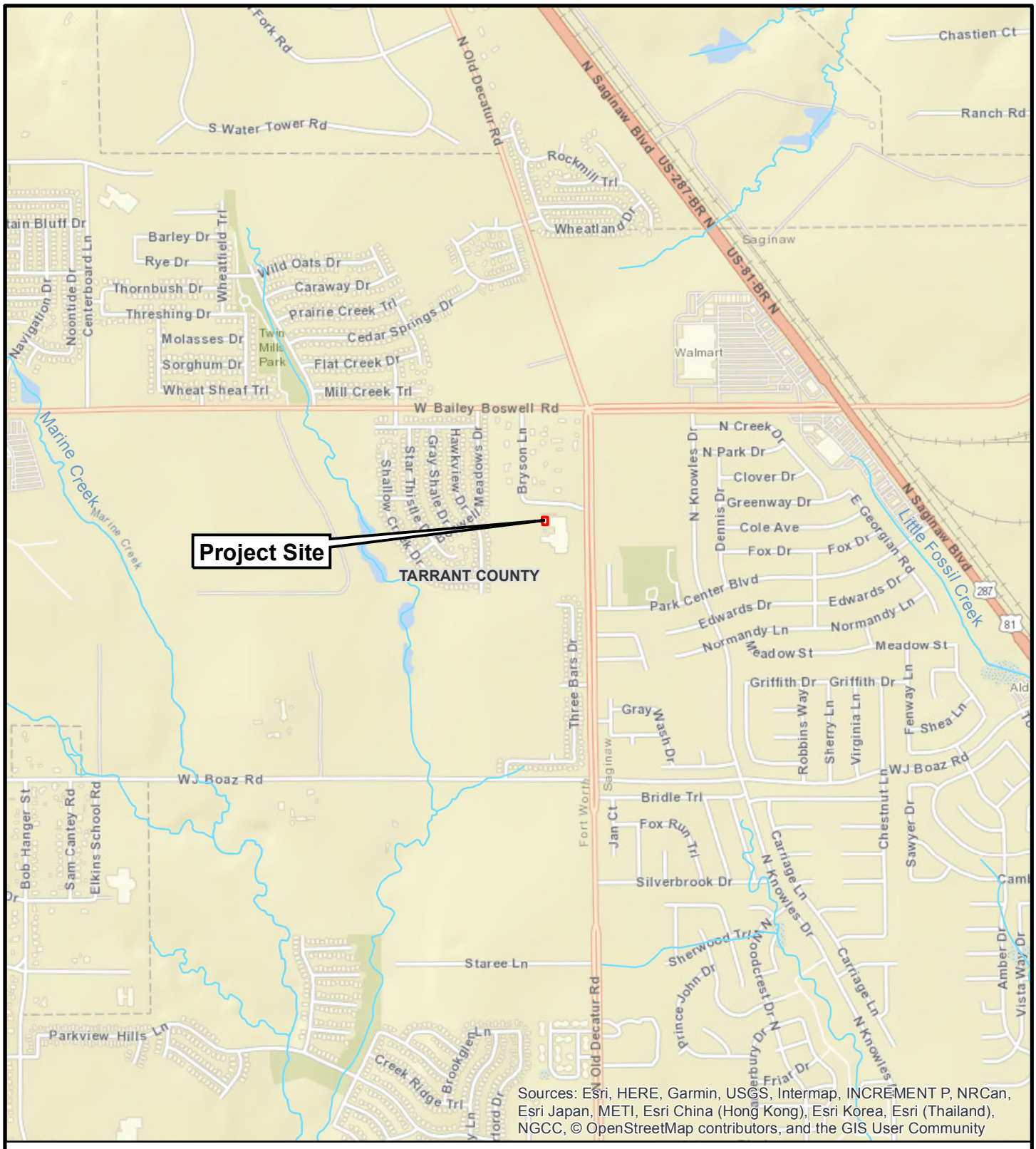
1.2 REPORT

A. The full geotechnical report prepared by the Owner's independent geotechnical and testing laboratory is available in the Architect's office for inspection by the Contractor.

B. This geotechnical report is not a part of the Contract Documents.

END OF DOCUMENT

--- THIS PAGE INTENTIONALLY BLANK ---



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Legend

Proposed Pavement

Scale: 1 inch = 1,500 feet

0 750 1,500 3,000 Feet

Coordinate System: State Plane Texas North Central FIPS 4202 Ft
Datum: D North American 1983

N

FUGRO

Gymnasium Addition and Renovation

VICINITY MAP

8601 Old Decatur Road

Fort Worth, Texas

Source:	Drawn By:	Date:	Project No.:	
Street map: ESRI ArcGIS Online, 2017	DG	December 4, 2018	04.40181092	PLATE 1

Legend

Approximate Boring Location

Proposed Pavement

Scale: 1 inch = 60 feet

0 30 60 120 Feet

Coordinate System: State Plane Texas North Central FIPS 4202 Ft
Datum: D North American 1983

N

FUGRO

Gymnasium Addition and Renovation — **SITE AND BORING PLAN**

8601 Old Decatur Road — **Fort Worth, Texas**

Source:	Drawn By:	Date:	Project No.:	
Orthophotography: Google Earth Pro, 2018	DG	December 4, 2018	04.40181092	**PLATE 2**

LOG OF BORING NO. B-1

Gymnasium Addition and Renovation
8601 Old Decatur Road
Fort Worth, Texas
PROJECT NO. 04.40181092

LATITUDE: 32.87736
LONGITUDE: -97.39254

DEPTH, FT	SYMBOL	SAMPLES	POCKET PEN Blows/ft. REC./RQD, %	STRATUM DESCRIPTION	LAYER ELEV./ DEPTH	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, PCF	COMPRESSIVE STRENGTH SOIL (TSF)	COMPRESSIVE STRENGTH ROCK (PSI)
				SURF. ELEVATION: Unknown									
				CONCRETE, (5-in.)									
				FILL, **F SANDY CLAY**, dark brown, with gravel	0.4								
			P = 4.0	**FAT CLAY (CH)**, brown, very stiff		24	68	23	45	86			
			P = 3.0		2.0	24							
			P = 4.5+	**FAT CLAY (CH)**, light brown and brown, with calcareous deposits, very stiff to hard		30	67	23	44				
5			34/12"		3.5								
				LEAN CLAY (CL), light brown, with calcareous deposits and limestone fragment, hard	5.0								
10			90/10.75"	**LIMESTONE**, tan, with clay layers	10.0								
15			100/2.75"										
20			100/0.75"										
25			100/0.5"										
				LIMESTONE, gray	27.0								
30			100/0.5"										
35			100/0.5"		35.0								

COMPLETION DEPTH: 35.0
DATE DRILLED: 11-30-18
WATER LEVEL / SEEPAGE: DRY
WATER LEVEL (UPON COMPLETION): 4.0

KEY:
P = Pocket Penetrometer
Note: All depths are measured in feet.
N = Standard Penetration Resistance

PLATE 3

LOG OF BORING NO. B-2

Gymnasium Addition and Renovation
8601 Old Decatur Road
Fort Worth, Texas
PROJECT NO. 04.40181092

LATITUDE: 32.87752
LONGITUDE: -97.39243

SURF. ELEVATION: Unknown

DEPTH, FT	SYMBOL	SAMPLES	POCKET PEN Blows/ft. REC./RQD, %	STRATUM DESCRIPTION	LAYER ELEV./ DEPTH	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX (PI), %	PASSING NO. 200 SIEVE, %	UNIT DRY WEIGHT, PCF	COMPRESSIVE STRENGTH SOIL (TSF)	COMPRESSIVE STRENGTH ROCK (PSI)
				CONCRETE (4-in.)									
			P = 1.5	**FILL**, **SAND**, yellowish brown	0.3	15							
			P = 4.5	**FAT CLAY (CH)**, brown, hard		28							
			P = 3.5		1.0	28							
			P = 3.5	**FAT CLAY (CH)**, light brown and brown, with calcareous deposits, very stiff		22					110	1.6	
5					3.0								
				LEAN CLAY (CL), light brown, with calcareous deposits, hard	6.0								
			P = 4.5			17	31	15	16				
10			100/2"	**LIMESTONE**, tan, with clay layers	10.0								
15			100/0.75"										
20			100/0.5"										
25			100/0.5"										
				LIMESTONE, gray	26.0								
30			100/0.5"										
35			100/0.5"		35.0								

COMPLETION DEPTH: 35.0
DATE DRILLED: 11-30-18
WATER LEVEL / SEEPAGE: DRY
WATER LEVEL (UPON COMPLETION): 7.0

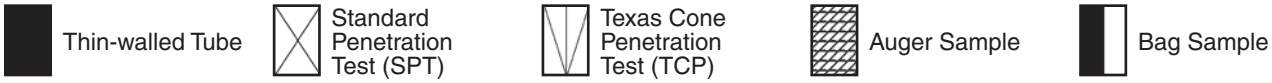
KEY:
P = Pocket Penetrometer
Note: All depths are measured in feet.
N = Standard Penetration Resistance

PLATE 4

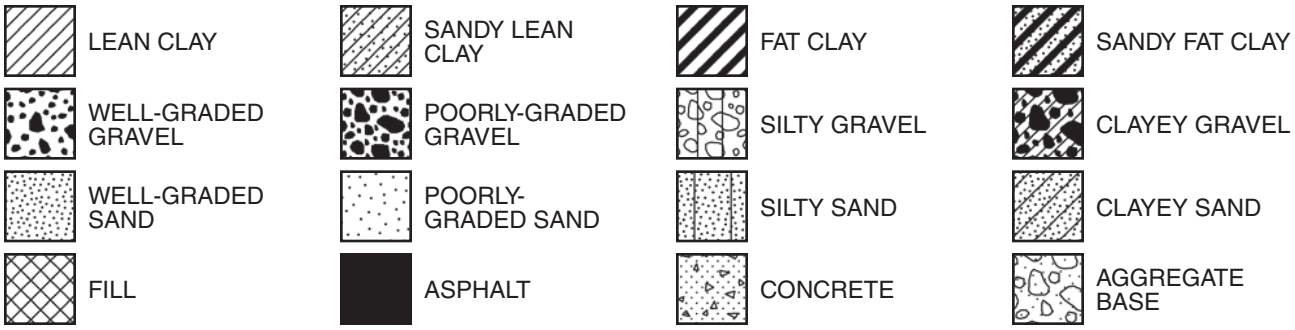
FUGRO LOG UC SOIL & ROCK FUGRO DATA TEMPLATE 100610.GDT FUGRO LIBRARY 022717.GLB I:\PROJECT FILES\PROJECTS-2018\18-1092 GYM ADDITIONS AND RENOVATION\7. DRAFTING\GINT\044018092.GPJ c.tsai 12/12/18

TERMS AND SYMBOLS USED ON BORING LOGS FOR SOIL

Sampler Types



Material Types



Consistency

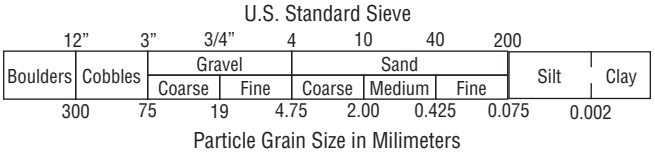
Strength of Fine Grained Soils		
Consistency	**SPT (# blows/ft)[1]**	**UCS (TSF)[1]**
Very Soft	< 2	< 0.25
Soft	2 - 4	0.25 - 0.5
Medium Stiff	4 - 8	0.5 - 1.0
Stiff	8 - 15	1.0 - 2.0
Very Stiff	15 - 30	2.0 - 4.0
Hard	> 30	> 4.0

Density of Coarse Grained Soils		
Apparent Density	**SPT (# blows/ft)**	**TCP (# blows/ft)[2]**
Very Loose	0 - 4	< 8
Loose	4 - 10	8 - 20
Medium Dense	10 - 30	20 - 60
Dense	30 - 50	60 - 100
Very Dense	> 50	> 100

Moisture

Moisture Content adapted from (3)	
Dry	No water evident in sample
Moist	Sample feels damp
Very Moist	Water visible on sample
Wet	Sample bears free water

Grain Size[3]



Structure[3]

Criteria for Describing Structure	
Description	**Criteria**
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick; note thickness
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick; note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

Secondary Components

Criteria for Describing Structure adapted from (3)	
Trace	< 5% of sample
Few	5% to 10% of sample
Little	10% to 25% of sample
Some	25% to 50% of sample

Size Modifiers for Inclusions	
Pocket	Inclusion of different material that is smaller than the diameter of the sample
Fragment	Pieces of a whole item - often used with shell and wood
Nodule	A concretion, a small, more or less rounded body that is usually harder than the surrounding soil (as in carbonate nodule) and was formed in the soil by a weathering process
Streak	A line or mark of contrasting color or texture. The mark or line should be paper thin, and it should be natural - not a smear caused by extruding or trimming the sample

FUGRO

Note: Information on each boring log is a compilation of subsurface conditions and soil and rock classificaitons obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.

References: [1] Peck, Hanson and Thornburn, (1974), Foundation Engineering.
[2]TxDOT, (1999), Tex-142-E, Laboratory Classification of Soils for Engineering Purposes.
[3] ASTM International, ASTM D 2488 Standard Practice for Description and Identification of Soils.

PLATE 5

TERMS AND SYMBOLS USED ON BORING LOGS FOR ROCK

Sampler Types

 Rock Core

 Texas Cone Penetration Test (TCP)

 Bag Sample

Notation for Rock Core Samples	
RC_	Rock Core sample + depth interval
Rec	Rock Core Sample Recovery (ASTM D2113)
RQD	Rock Quality Designation (ASTM D6032)

Material Types

 LIMESTONE

 SHALE

 SANDSTONE

 MARL

 WEATHERED LIMESTONE

 WEATHERED SHALE

 WEATHERED SANDSTONE

 WEATHERED MARL

Weathering[4]

Weathering Grades of Rock Mass	
Slightly	Discoloration indicates weathering of rock material and discontinuity surfaces
Moderately	Less than half of the rock material is decomposed or disintegrated to a soil
Highly	More than half of the rock material is decomposed or disintegrated to a soil
Completely	All rock material is cecomposed and/or disintegrated to a soil. The original mass structure is still largely intact
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed

Hardness

Criteria for Field Hardness	
Very Soft	Can be carved with a knife. Can be excavated readily with point of pick. Pieces 1" or more in thickness can be broken by finger pressure. Readily scratched with fingernail
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows with the pick point. Small, thin pieces can be broken by finger pressure
Medium	Can be grooved or gouged ¼" deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1' maximum size by hard blows with the point of a pick
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach a hand specimen
Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows from a hammer or pick

Grain Size[3]

U.S. Standard Sieve

3"	3/4"	4	10	40	200
Gravel		Sand			
Coarse	Fine	Coarse	Medium	Fine	
75	19	4.75	2.00	0.425	0.075

Particle Grain Size in Milimeters

Secondary Components[3]

Criteria for Describing Structure	
Trace	< 5% of sample
Few	5% to 10% of sample
Little	10% to 25% of sample
Some	25% to 50% of sample

Structure

Bedding Thickness and Spacing of Planar Features			
Type	**Spacing**	**Thickness**	**Fracture Spacing**
Parting	< 1/8 in.	Laminar	NA
Seam	1/8 to 3/4 in.	Extremely thin	Extremely close (< 3/4 in.)
	3/4 to 2 1/2 in.	Very thin	Very close
Layer	2 1/2 to 6 in.	Thin	Close
	6 to 24 in.	Medium	Moderate
Bed	2 to 7 ft.	Thick	Wide
	7 ft. to 20 ft.	Very thick	Very wide
	> 20 ft.	Extremely thick	Extremely wide
	Massive	No stratification observed	NA
	Occasional	Occurring once or less per foot	
	Frequently	Occurring more than once per foot	

Discontinuities	
Joint	A natural fracture along which no displacement has occurred. May occur in parallel groups called sets.
Fracture/ Shear	A natural fracture along which differential movement has occurred. May be slickensided or striated.
Fault	A natural fracture along which displacement has occurred. Usually lined with gouge and slickensides.

Surface Planarity	
Curved	A moderately undulating surface, with no sharp breaks or steps.
Planar	A flat surface
Stepped	A surface with asperities or steps. The height of the asperity should be estimated or measured.

Roughness	
Very Rough	Near vertical steps and ridges occur on the discontinuity
Rough	Some ridges and side-angle steps are evident; asperities are clearly visible, surface feels very abrasive.
Slightly Rough	Asperities on the discontinuity surfaces can be seen and felt.
Smooth	Surface appears smooth and feels smooth.
Slickensided	Evidence of polishing and movement are visible.

Aperture	
Tight	Core pieces on either side of fracture can be fitted together so that no visible void spaces remain.
Open	Core pieces on either side of fracture cannot be fitted tightly together and voids are visible.
Healed	A completely healed fracture or vein is not considered a discontinuity and should not be included when describing rock core fracturing or calculating RQD. This feature should be described including a record of dip, spacing, thickness, type of filling and any observed alteration.

FUGRO

Note: Information on each boring log is a compilation of subsurface conditions and soil and rock classificaitons obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.

References: [1] Peck, Hanson and Thornburn, (1974), Foundation Engineering.
[3] ASTM International, ASTM D 2488 Standard Practice for Description and Identification of Soils.
[4] British Standard (1981), Code of Practice for Site Investigation BS 5930.

AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

[ ] Corporation
[ ] Partnership
[ ] Individual
[ ] Joint Venture
[ ] Other

NAME OF PROJECT: *(if applicable)*
Bryson ES, Elkins ES, Eagle Mountain ES, & Boswell HS
Additions & Renovations
Eagle Mountain-Saginaw I.S.D.
Fort Worth, Texas

TYPE OF WORK: *(file separate form for each Classification of Work)*

[ ] General Construction
[ ] HVAC
[ ] Electrical
[ ] Plumbing
[ ] Other: *(Specify)*

§ 1 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

§ 1.3.3 President's name:

§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership (if applicable):

§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4 REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5 FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6 SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of

Notary Public:

My Commission Expires:

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year «2018 »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Road
Fort Worth, TX 76179 »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

« »
« »
« »

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), all sections of the Project Manual and Construction Documents, Drawings, Specifications, Geotechnical Reports, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. Any reference to Contract Documents or any documents included in the Contract Documents and/or supplemented for this Project, shall refer to the Contract Documents as amended for this Project. *(Warning: Make sure that any Supplementary Conditions do not contradict the provisions of the A201.)*

"Construction Documents" means: all Drawings, specifications, submittals, transmittals, deliverables, instructions to Contractors, and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants and which set forth in detail the requirements for construction of the Project.

§ 1.2 This Agreement represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. Any revision, amendment, or modification to the Standard Form of this Agreement shall be valid, binding, and enforceable only if said revision, amendment or modification is made conspicuous by being underlined, lined-through, or highlighted in this Agreement signed by Contractor and the authorized representative of Owner's Board of Trustees. In the event of conflict, terms and conditions contained in the Agreement shall take precedence over terms and conditions contained in the General Conditions and the terms and conditions in the General Conditions shall take precedence over all other terms and conditions contained in the other Contract Documents. If the Request for Proposals and the Proposal are included in the Contract Documents, then the Request for Proposals shall take precedence over the Proposal, unless specifically agreed otherwise herein.

§ 1.3 The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into or amend a contract, to approve changes in the scope of the Work, to approve and execute a Change Order or Construction Change Directive modifying the Contract Sum, or to agree to an extension to the date of Substantial or Final Completion or to terminate a contract. The Owner designates the following as the individual authorized to sign documents on behalf of the Board of Trustees, following appropriate Board action: *(insert name and title of designee)* _____, or other Board designee.

§ 1.4 The Board designates the authorized representatives identified in Paragraph 8.3 to act on its behalf in other respects.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« X »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« The commencement date will be the first business day after the Contractor's receipt of the written notice to proceed. The notice to proceed shall not be issued by Architect until the Agreement has been signed by the Contractor, approved by the Owner's Board of Trustees, signed by the Owner's authorized representative, and Owner and Architect have received all required payment and performance bonds and insurance, in compliance with Article 11 of AIA Document A201-2017. »

~~If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.~~

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall diligently prosecute and achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

Final Completion shall be 30 calendar days after the date of Substantial Completion, subject to adjustments of the Contract Time as provided in the Contract Documents.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.
(Note: Optional Paragraph)

§ 4.1.1 The Contract Sum contains an Owner's Contingency in the amount of $_____. This contingency is for the sole use of the Owner to be used for changes in the scope of the Work and for the betterment of the Project. Owner's authorized representative may approve any expenditure from Owner's Contingency without further Board of Trustees approval. If the Owner's Contingency is not expended or not fully expended, then any unused portion shall belong to the Owner and shall be credited to the Owner in calculating final payment.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 [Paragraph Deleted]. ~~Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.~~

~~(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)~~

~~Item~~	~~Price~~	~~Conditions for Acceptance~~

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« **§ 4.5.1 Substantial Completion.** Time is of the essence in all phases of the Work. It is specifically understood and agreed by and between Owner and Contractor that time is of the essence in the Substantial Completion of the Project and Owner shall sustain damages as a result of Contractor's failure, neglect or refusal to achieve said deadlines. Such damages are, and will continue to be, impracticable and extremely difficult to determine. Execution of this Agreement under these specifications shall constitute agreement by Owner and Contractor that the amounts stated below are the minimum value of the costs and damages caused by failure of Contractor to complete the Work within the allotted or agreed extended times of Substantial Completion, that such sums are liquidated damages and shall not be construed as a penalty, and that such sums may be deducted from payments due Contractor if such delay occurs. It is expressly understood that the said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not completed within the agreed time, or within the agreed extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty, said damages being caused by, but not limited to, additional compensation for personnel, attorneys fees, architectural fees, engineering fees, program management fees, inspection fees, storage costs, food service costs, transportation costs, utilities costs, costs of temporary facilities, loss of interest on money, and other increased costs, all of which are difficult to exactly ascertain. Failure to complete the Work within the designated or agreed extended dates of Substantial Completion, shall be construed as a breach of this Agreement. It is expressly agreed as a part of the consideration inducing the Owner to execute this Agreement that the Owner may deduct from any Payment made to the Contractor a sum equal to $ per day for each and every additional calendar day beyond the agreed date of Substantial Completion.

§ 4.5.2. Final Completion. In addition, timely Final Completion is an essential condition of this Agreement. Contractor agrees to achieve Final Completion of the Agreement within 30 calendar days of the designated or agreed

extended date of Substantial Completion. It is specifically understood and agreed by and between Owner and Contractor that time is of the essence in the Final Completion of the Project and Owner shall sustain additional damages as a result of Contractor's failure, neglect or refusal to achieve said deadline. Such damages are, and will continue to be, impracticable and extremely difficult to determine. Execution of this Agreement under these specifications shall constitute agreement by Owner and Contractor that the amounts stated below are the minimum value of the costs and damages caused by failure of Contractor to complete the Work within the allotted or agreed extended times for Final Completion, that such sums are liquidated damages and shall not be construed as a penalty. It is expressly understood that the said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not finally completed within the agreed time, or within the agreed extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty, said damages being caused by, but not limited to, additional compensation for the following categories of damages to the Owner: potential hazards to students, staff and visitors, additional architectural, engineering, program management fees (and fees of any other consultants); increased administrative or operational expenses; additional attorney's fees; increased maintenance and custodial costs and additional, utilities, security and clean-up costs, and other increased costs. Failure to complete the Work within the designated or agreed extended dates of Final Completion, shall be construed as a breach of this Agreement. Owner and Contractor agree that should Contractor fail to achieve Final Completion of the Agreement by the deadline, Owner shall continue to be damaged to a greater degree by such delay. Contractor and Owner agree that the amount of liquidated damages for each calendar day Final Completion is delayed beyond the date set for Final Completion shall be the sum of $_____ per day. Owner may deduct such liquidated damages from any Payment made to Contractor before or at Final Payment; or, if sufficient funds are not available, then Contractor shall pay Owner, the amounts specified per day for each and every calendar day the breach continues after the deadline for Final Completion of the Work.

§ 4.5.3 Such damages shall be in addition to, and not in lieu of, any other rights or remedies Owner may have against Contractor for failure to timely achieve Final Completion, and damages for failure to achieve Substantial Completion and failure to achieve Final Completion may run concurrently. If the Work is not finally completed by the time stated in the Agreement, or as extended, no payments for Work completed beyond that time shall be made until the Project reaches Final Completion. »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 ~~Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.~~ The Contractor shall submit monthly Applications for Payment to the Architect on AIA Form G702 for approval. Continuation sheets shall be submitted on AIA Form G703. If the Architect approves the application, then they shall submit a Certificate for Payment to the Owner. The Architect may require any additional information deemed necessary and appropriate to substantiate the Application for Payment. Materials that are verified to be on the jobsite or other approved location for use in the Project may also be incorporated into the Application for Payment. The Architect shall have seven (7) days from date of receipt from the Contractor of an Application for Payment to approve or reject all or any part of the Application for Payment. The Owner shall pay the undisputed amounts certified by the Architect to the Contractor within ( ) days of receipt of the

Certificate for Payment from the Architect unless otherwise provided in the Contract Documents. Undisputed amounts unpaid after the date on which payment is due shall bear interest pursuant to Texas Government Code Section 2251.025. *(Note: In Texas, the blank should be filed in with "30" if the Board meets twice a month, and "45" if the Board meets once a month.*
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum, less any unused Owner's contingency, among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified to the extent approved by the Owner in writing, as provided in Article 7.3.9 of AIA Document A201™–2017, General Conditions of the Contract for Construction.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017 or amounts certified by the Architect and disputed by the Owner; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner ~~may~~ shall withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« Percent (%) [*If the retainage is over 5%, then the retainage shall be deposited in an interest-bearing account and the interest earned on the retainage shall be paid to the Contractor upon completion of the Project, pursuant to Texas Government Code Section 2252.032*] »

§ 5.1.7.1.1 [Paragraph Deleted.] ~~The following items are not subject to retainage:~~
~~(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)~~

~~« »~~

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

«NONE. »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon ~~Substantial~~ Final Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. ~~The Application for Payment submitted at Substantial Completion shall not include retainage as follows:~~
~~*(Insert any other conditions for release of retainage upon Substantial Completion.)*~~

~~« »~~

§ 5.1.8 [Paragraph Deleted.] ~~If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201 – 2017.~~

§ 5.1.9 Except with the Owner's prior written approval, or as otherwise provided in Section 9.3.2 of the AIA Document A201-2017, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.10 If Owner is entitled to deduct liquidated damages, or any other damages or amounts provided in the Contract Documents, including clean-up fees, then Owner shall be entitled to deduct such liquidated damages, amounts and fees at any time.

§ 5.1.11 If Contractor fails or refuses to complete the Work, or has unsettled claims with Owner, any payment to Contractor shall be subject to deduction for such amounts as the Architect if applicable, shall determine as the cost for completing incomplete Work and the value of unsettled claims.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, minus disputed sums, authorized deductions and liquidated damages, shall be made by the Owner to the Contractor ~~when~~after

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct nonconforming Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; ~~and~~

.2 the Contractor has provided all documents required by Sections 3.5 ***et seq***. and 9.10.2 *et seq*. of AIA Document A201-2017

.3 a final Certificate for Payment has been issued by the Architect; and

4. Owner's Board of Trustees has voted to accept the Work and approve the Final Payment.

§ 5.2.2 The Owner's final payment of undisputed sums to the Contractor shall be made no later than 30 days after Owner's Board of Trustees' vote approving Final Payment. ~~the issuance of the Architect's final Certificate for Payment, or as follows:~~

~~« »~~

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest pursuant to Texas Government Code Section 2251.025. ~~from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~
~~*(Insert rate of interest agreed upon, if any.)*~~

~~« »~~ % ~~« »~~

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

All disputes relating to this Agreement shall be resolved pursuant to the terms of Article 15 of the AIA Document A201-2007, as amended. ~~The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.~~

~~*(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*~~

~~« »~~
~~« »~~
~~« »~~
~~« »~~

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« X »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 [Paragraph Deleted] ~~If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:~~
~~(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)~~

~~« »~~

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Road
Fort Worth, TX 76179 »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior written notice to the other party.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

«**§ 8.7.1** The Agreement shall be governed by the laws of the State of Texas, and any litigation shall be conducted in state district court. Mandatory and exclusive venue shall be in Tarrant County, Texas.

§ 8.7.2 As a material consideration of the making of this Agreement, the modifications to this Agreement shall not be construed against the maker of said modifications.

§ 8.7.3 Notwithstanding anything to the contrary in this Agreement, or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

§ 8.7.4 Section 1.5 of AIA Document A201-2017 shall govern Contractor's use of the Construction Documents.

§ 8.7.5 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractor's employees, subcontractors, and all other persons carrying out the Contract.

§ 8.7.6 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's full name in a typeface large enough to be seen from a reasonable distance.

§ 8.7.7 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to park their personal motor vehicles on Owner's property only in the parking places

designated by the Owner's campus principal. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense.

§ 8.7.8 Contractor shall follow, and shall require all employees, agents or subcontractors to follow, applicable ordinances of the municipality in which the Project is located. In addition, if not covered by the municipality's tree ordinance, Contractor shall barricade and protect all trees on the Project.

§ 8.7.9 Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's subcontractor's forces' actions, omissions, or failure to secure the Work or connecting or adjacent property of Owner.

§ 8.7.10 The Contractor may not assign its responsibilities, duties, obligations and rights under this Agreement, without the express written consent of the Owner. This does not prevent Contractor from engaging subcontractors to perform various phases of the Project, but Contractor shall be fully responsible to Owner for the work, actions and omissions of all such subcontractors

§ 8.7.11 This Agreement, in its entirety, shall be binding upon all the parties hereto, their respective successors, heirs, executors, administrators or assigns.

§ 8.7.12 Execution of this Agreement shall constitute approval and acceptance of all terms, covenants and conditions as modified and contained in the Contract Documents.

§ 8.7.13 This Agreement is subject to all applicable federal and state laws, rules, and regulations. Invalidity of any portion of this Agreement under the laws of the State of Texas or of the United States shall not affect the validity of the remainder of this Agreement.

§ 8.7.14 By signing this Agreement, the undersigned certifies as follows: "Under Section 231.006, Texas Family Code, the vendor or applicant certifies that the individual or business entity named in the contract, bid, or application is not ineligible to receive the specified grant, loan, or payment and acknowledges that this contract may be terminated, and payment may be withheld if this certification is inaccurate."

§ 8.7.15 Unless otherwise noted, terms in this Agreement shall have the same meaning as those in the edition of AIA Document A201-2007, General Conditions of the Contract for Construction, as amended for the Project.

§ 8.7.16 To the extent that any portion of the Work requires a trench excavation exceeding five (5) feet in depth, in accordance with Texas Health and Safety Code Section 756.023(a), Contractor shall fully comply, and shall require any applicable subcontractor to comply, with:

.1 The Occupational Safety and Health Administration standards for trench safety in effect for the construction of the Work;

.2 The special shoring requirements, if any, of the Owner; and

.3 Any geotechnical information obtained by Owner for use by the Contractor in the design of the trench safety system.

.4 Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used. Said cost shall be included within the Contract Sum.

§ 8.7.17 No delay or omission by Owner in exercising any right or power accruing upon the noncompliance or failure of performance by Contractor of any of the provisions of this Agreement shall impair any such right or power or be construed to be a waiver thereof. A waiver by Owner of any of the covenants, conditions or agreements hereof to be performed by Contractor shall not be construed to be a waiver of any subsequent breach thereof or of any other covenant, condition or agreement herein contained.

§8.7.18 Contractor stipulates that Owner is a political subdivision of the State of the Texas, and, as such, enjoys immunities from suit and liability as provided by the constitution and laws of the State of Texas. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein, and as specifically authorized by law.

§ 8.7.19 By executing this Agreement, Contractor verifies that it does not boycott Israel, and it will not boycott Israel during the terms of this Contract.

§ 8.7.20 Contractor verifies and affirms that it is not a foreign terrorist organization as identified on the list prepared and maintained by the Texas Comptroller of Public Accounts. If Contractor has misrepresented its inclusion on the Comptroller's list, such omission or misrepresentation will void this Contract »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

~~**.4** AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:~~
~~*(Insert the date of the E203-2013 incorporated into this Agreement.)*~~

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

«**RFP/CONTRACTOR PROPOSAL.** »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*
Eagle Mountain-Saginaw Independent School	

DRAFT

AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

« »
« »

THE OWNER:
(Name, legal status and address)

« Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Road
Fort Worth, TX 76179 »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Contractor shall provide builder's risk insurance as required in A.3.3.2.1. ~~Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.~~

§ A.2.3.1.1 [NOT USED]~~**Causes of Loss.** The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:~~

~~(Indicate below the cause of loss and any applicable sub-limit.)~~

~~Causes of Loss~~	~~Sub-Limit~~

§ A.2.3.1.2 [NOT USED] ~~**Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:~~

~~(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)~~

~~Coverage~~	~~Sub-Limit~~

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall ~~continue the insurance required by Section A.2.3.1 or, if necessary,~~ replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by ~~this~~ Section A.2.3.1.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1.3 have consented in writing to ~~the continuance of~~ replacement of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner ~~shall~~ may purchase and maintain, until the expiration of the period for correction of Work as set forth in

Section 12.2.2 of the General Conditions, ~~"all-risks"~~ property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.3.~~2.~~3.~~21~~, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties. *(NOTE: Although this paragraph has been revised to make the District's purchase of property insurance optional, Districts are strongly advised to purchase such insurance if the District does not already have such insurance.)*

§ A.2.4 Optional Extended Property Insurance.

[NOT USED] ~~The Owner shall purchase and maintain the insurance selected and described below.~~
~~*(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)*~~

[« »] § A.2.4.1 ~~Loss of Use, Business Interruption, and Delay in Completion Insurance~~, ~~to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.~~

~~« »~~

[« »] § A.2.4.2 ~~Ordinance or Law Insurance~~, ~~for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.~~

~~« »~~

[« »] § A.2.4.3 ~~Expediting Cost Insurance~~, ~~for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.~~

~~« »~~

[« »] § A.2.4.4 ~~Extra Expense Insurance~~, ~~to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.~~

~~« »~~

[« »] § A.2.4.5 ~~Civil Authority Insurance~~, ~~for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.~~

~~« »~~

[« »] § A.2.4.6 ~~Ingress/Egress Insurance~~, ~~for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.~~

~~« »~~

[« »] § A.2.4.7 ~~Soft Costs Insurance~~, ~~to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.~~

~~« »~~

§ A.2.5 Other Optional Insurance.

The Owner mayshall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] **§ A.2.5.2 Other Insurance**

(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) at least five business days after execution of the Contract documents and prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured ~~on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies~~on all of Contractor's insurance policies, except Contractor's workers compensation insurance. These certificates and the insurance policies required by this Article shall contain a provision that coverages afforded under the policies will not be canceled, reduced, or restricted for any reason, other than nonpayment of premium until at least 30 days' prior written notice of such cancellation, reduction, or restriction has been given to the Owner and Contractor. An additional certificate, policy, and endorsement evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment, as required by Section 9.10.2, and thereafter upon renewal or replacement of such coverage Information concerning reduction or restriction of coverage on account of revised limits or claims paid under the General Aggregate, or cancellation or expiration of the insurance shall be furnished by written notice to the Owner from~~by~~ the Contractor within three business days of the date Contractor knew or should have known of the cancellation, reduction, or restriction. At least 30 calendar days prior to the date of expiration of any required insurance policy, Contractor shall provide Owner written notice of the impending expiration. In addition**,** Contractor shall also provide copies of all policies, declarations, and endorsements for such insurance to Owner as required by Section 11.0.2 of the 2017 AIA A201 General Conditions as amended for this Project.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor. If the insurance required by this Section A.3.1 is subject to deductibles or self-insured retentions, the Contractor shall be responsible for all loss not covered because of such deductibles or retentions. For any claim made against the Contractor's policies of insurance, the deductible shall not exceed $2,500 for a Contract Sum (or Guaranteed Maximum Price, if the Project is a Construction Manager at Risk project), of less than $4 million. For a Contract Sum (or Guaranteed Maximum Price, if the Project is a Construction Manager at Risk project), of $4 million or more, the deductible shall not exceed $5,000.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage and any other insurance required by the Agreement, with the exception of Workers' Compensation insurance, to be endorsed to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole

or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor and the Contractor's subcontractors shall purchase and maintain such insurance as will protect them and the Owner from claims which may arise out of, or result from, the Contractor's operations under the Contract whether such operations be by Contractor or by any Subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, in the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. (See also the insurance requirements included in Article 11 of the 2017 AIA A201 General Conditions as amended for this Project.) The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions. ~~, unless a different duration is stated below:~~

~~*(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)*~~

The insurance required by this Section shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. The limits of liability for such insurance shall be in at least the following amounts as specified below.

(NOTE: Amounts of insurance coverage have been left blank so that Districts can enter the appropriate amounts for their Projects. DO NOT LEAVE ANY BLANK UNFILLED IF THAT COVERAGE IS REQUIRED OR CHOSEN FOR THE PROJECT. If a particular coverage will not be used for the Project, delete the unused section. If the District has questions on the appropriate amounts or types of coverage, it is strongly suggested that the District contact its legal counsel and insurance agent.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») each occurrence, «Two Million Dollars » ($ «2,000,000 ») general aggregate, and «Two Million Dollars » ($ «2,000,000 ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness, or disease, including occupational sickness or disease, and death of any person, with a sublimit not less than $1,000,000 for medical expenses per person for bodily injury, included within the limits noted above;

.2 personal injury and advertising injury with a limit not less than $2,000,000;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of the Work and out of completed operations, said coverage to be maintained for two years after Final Completion(to be maintained for a period of two years after Final Payment; Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during this period and Owner shall be named by endorsement as an Additional Insured for such coverage) and must include Completed Operations coverage for Contractor, its sub-contractors, and Owner;

~~; and~~

.5 the Contractor's contractual liability, including but not limited to, indemnity obligations under Section 3.18 of the General Conditions~~.~~; and

.6 General Aggregate per Project endorsement.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned, hired, or any other vehicles used, by the Contractor, with policy limits of not less than ~~« » ($ « »)~~ than those stated below per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage. *(Note: Texas statutory minimum for school districts is $100,000 per person, $300,000 per occurrence, and $100,000 property damage.)* Such minimum limits shall be stated as follows, or in a combined single limit policy in the amount of at least $1,000,000.

.1	Bodily Injury (per person)	$1,000,000
.2	Bodily Injury (per accident)	$1,000,000
.3	Property Damage	$1,000,000

§ A.3.2.4 The Contractor may not achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance. ~~, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and i~~In no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.4.1 Umbrella Excess Liability coverages shall be in at least the following amounts:

.1	$10,000,000	each occurrence
.2	$10,000,000	aggregate
.3	Aggregate Per Project Endorsement	

§ A.3.2.5 Workers' Compensation ~~at statutory limits~~.

.1	State:	Statutory Benefits

.2	Employer's Liability:	$1,000,000	per accident
		$1,000,000	disease, policy limit
		$1,000,000	disease, each employee

§ A.3.2.5.1 Texas Workers' Compensation Insurance. A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Department of Insurance (TDI), or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-84), showing statutory workers' compensation insurance coverage for the Contractor's employees providing services on a Project is required for the duration of the Project.

§ A.3.2.5.1.1 Duration of the Project includes the time from the beginning of the Work on the Project until the Contractor's work on the Project has been completed and accepted by the Owner.

§ A.3.2.5.1.2 Persons providing services on the Project ("subcontractor" in Texas Labor Code Section 406.096) include all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the Project.

§ A.3.2.5.1.3 Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other services related to the Project. Services do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

§ A.3.2.5.1.4 The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.

§ A.3.2.5.1.5 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the Contract.

§ A.3.2.5.1.6 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the Owner showing that coverage has been extended.

§ A.3.2.5.1.7 The Contractor shall obtain from each person providing services on the Project, and provide to the Owner:

.1 A certificate of coverage, prior to that person beginning work on the Project, so the Owner will have on file certificates of coverage showing coverage for all persons providing services on the Project; and

.2 No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

§ A.3.2.5.1.8 The Contractor shall retain all required certificates of coverage for the duration of the Project and for one year thereafter.

§ A.3.2.5.1.9 The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

§ A.3.2.5.1.10 The Contractor shall post on each Project site a notice, in the text, form, and manner prescribed by the TDI, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

§ A.3.2.5.1.11 The Contractor shall contractually require each person with whom it contracts to provide services on the Project to:

.1 Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all of its employees providing services on the Project for the duration of the Project;

.2 Provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project for the duration of the Project;

.3 Provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

.4 Obtain from each other person with whom it contracts, and provide to the Contractor:

.1 A certificate of coverage, prior to the other person beginning work on the Project; and

.2 A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

.5 Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;

.6 Notify the Owner in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and

.7 Contractually require each person with whom it contracts to perform as required by items 1-6, with the certificates of coverage to be provided to the person for whom they are providing services.

§ A.3.2.5.1.12 By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the TDI's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

§ A.3.2.5.1.13 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor that entitles the Owner to declare the Contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the Owner.

§ A.3.2.5.1.14 The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996. *28 TAC § 110.110(i)*

§ A.3.2.6 Employers' Liability with policy limits not less than «One Million Dollars » ($ «1,000,000.00 ») each accident, « One Million Dollars» ($ «1,000,000.00 ») each employee, and «One Million Dollars » ($ «1,000,000.00 ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« X »] **§ A.3.3.2.1** ~~P~~Builder's Risk Property insurance ~~of the same type and scope satisfying the requirements identified in Section A.2.3,~~ which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. ~~The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, t~~ The Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

~~*(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)*~~

~~« »~~

.1 Builder's Risk. Unless otherwise provided Contractor shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the state of Texas a property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to

cover the total value of the entire Project on a replacement cost basis , including boiler and machinery insurance, Coverage, if not included in the base coverage, shall include coverage against the perils of fire, (with extended coverage) and physical loss or damage including, without limitation or duplication of coverage, lightning, collapse, earthquake, flood, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, theft, vandalism, malicious mischief, falsework, testing and start-up, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, and all other perils, and shall include materials stored on-site, off-site and in transit. The Contractor's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion; and thereafter, as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

.2 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

.3 Causes of Loss Sub-Limit. Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows: *(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)*

.4 Coverage Sub-Limit. Unless the parties agree otherwise, upon Substantial Completion, the Contractor shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

.5 Adjustment of Loss. The Owner, as fiduciary, shall have power to adjust and settle any loss arising out of the Work, with insurers, regardless of the purchaser of the insurance policy. The Contractor, upon receipt of proceeds, shall, as a fiduciary, pay all subcontractors their just shares of insurance proceeds received by the Contractor, and, by appropriate agreements, shall require subcontractors to make payment to their sub-subcontractors in similar manner. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, then replacement of damaged property shall be performed by the Contractor with the insurance proceeds upon issuance of a Notice to Proceed from the Owner.

.6 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

.7 Insurance for Existing Structures If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Contractor shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Contractor shall be responsible for all co-insurance penalties.

.8 Employee Theft or Dishonesty. If this Builder's Risk policy excludes Employee Theft or Dishonesty coverage, including Third Parties, Contractor shall obtain separate coverage sufficient to protect Owner's interest and in an amount agreeable to Owner.

.9 Cancellation. The insurance policies required by this Section shall contain a provision that coverages afforded under the policies will not be canceled for any reason, other than nonpayment of premium, or reduced or restricted due to a material change in coverage until at least 30 days' prior written notice of such cancellation or material change has been given to the Owner. Contractor shall provide Owner 30 days prior written notice of the expiration of any policy required by Section A.3.1.1.

.10 Construction Manager at Risk. If Contractor is a Construction Manager at Risk, then, as specified in each AIA A133 Exhibit A Amendment, the amount of Builder's Risk insurance coverage shall be an amount equal to the Guaranteed Maximum Price; otherwise, in the total amount of the Contract Sum.

.11 Deductibles. For any claim made against the builder's risk insurance, the deductible shall not exceed $2,500 for a Contract Sum (or Guaranteed Maximum Price, if the Project is a Construction Manager at Risk project), of less than $4 million. For a Contract Sum (or Guaranteed Maximum Price, if the Project is a Construction Manager at Risk project), of $4 million or more, the deductible shall not exceed $5,000.

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, subject to the requirements of A201-2017, Article 11.1.2.~~3~~1, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

The form of Payment and Performance Bonds shall be subject to the requirements of Texas law~~AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™,~~ current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

«See A201-2017, Article 11 »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*
Eagle Mountain-Saginaw Independent School	

DOCUMENT 00 61 13.13

PERFORMANCE BOND FORM **Bond No.: _____**
(Penalty of this bond must be 100% of contract amount)

KNOW ALL MEN BY THESE PRESENTS, that: _____
(hereinafter called the Principal), as principal, and
a corporation organized and existing under the laws of the State of _____ authorized and admitted to do business in the State of Texas and licensed by the State of Texas to execute bonds as Surety (hereinafter called the Surety), as Surety, are held and firmly bound unto

_____

_____

(hereinafter called the Obligee) in the amount of _____

_____

Dollars($_____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated this _____ day of _____, _____.

BRYSON ES, ELKINS ES, EAGLE MOUNTAIN ES & BOSWELL HS
EAGLE MOUNTAIN-SAGINAW I.S.D.
FORT WORTH, TEXAS

which contract is hereby referred to and made a part hereof as fully and the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 22.53 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this Instrument this _____ day of _____, _____.

(Seal)
_____ _____
Principal

_____
Surety Address By: _____

_____ (Seal)
_____
Surety
Surety Telephone Number

By: _____
Attorney-in-Fact

---THIS PAGE INTENTIONALLY BLANK ---

DOCUMENT 00 61 13.16

PAYMENT BOND FORM **Bond No.: _____**

KNOW ALL MEN BY THESE PRESENTS, that: _____
(hereinafter called the Principal), as principal,
a corporation organized and existing under the laws of the State of _____ authorized and admitted to do business in the State of Texas and licensed by the State of Texas to execute bonds as Surety (hereinafter called the Surety), as Surety, are held and firmly bound unto

_____

_____

(hereinafter called the Obligee) in the amount of _____

_____

Dollars($_____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated this _____ day of _____, _____.

BRYSON ES, ELKINS ES, EAGLE MOUNTAIN ES, & BOSWELL HS
EAGLE MOUNTAIN-SAGINAW I.S.D.
FORT WORTH, TEXAS

which contract is hereby referred to and made a part hereof as fully and the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a Subcontractor in the prosecution of the work provided for in said contract, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 22.53 of the Texas Government Code and all liabilities on this bond to all such claimants shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this Instrument this _____ day of _____, _____.

_____ (Seal)
Witness: Principal

_____ By: _____

Witness: _____
(Seal) Surety

_____ By: _____
Attorney-in-Fact

_____

_____ _____
Surety Address Surety Telephone Number

---THIS PAGE INTENTIONALLY BLANK ---

DOCUMENT 00 65 00

RELEASE OF LIEN DOCUMENTS

APPENDIX INDEX:

[Note: the attached forms are duplicated *verbatim* (without editing) from HB 1456.]

FORM 1: CONDITIONAL WAIVER FOR PROGRESS PAYMENTS

* * * * * * *

CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project:

Job No.:

On receipt by the signer of this document of a check from _____
_____
(maker of check) in the sum of $_____
payable to _____
(payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____
_____
(owner) located at (location) to the following extent: _____
_____
_____
_____(job description).

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____
(person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 2: UNCONDITIONAL WAIVER FOR PROGRESS PAYMENTS

* * * * * * *

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. IT IS PROHIBITED FOR A PERSON TO REQUIRE YOU TO SIGN THIS DOCUMENT IF YOU HAVE NOT BEEN PAID THE PAYMENT AMOUNT SET FORTH BELOW. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project:

Job No.:

The signer of this document has been paid and has received a progress payment in the sum of $_____ for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) on the property of _____ (owner) located at _____ (location) to the following extent:_____

_____

_____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the above referenced project to the following extent: _____

_____

_____

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in **full** all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 3: CONDITIONAL WAIVER FOR FINAL PAYMENT

* * * * * * *

CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project:

Job No.:

On receipt by the signer of this document of a check from _____
_____
_____(maker of check) in the sum of
$_____ payable to
_____
_____ (payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____
_____
(owner) located at _____
_____
(location) to the following extent:_____
_____
_____(job description).

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to _____
(person with whom signer contracted).

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 4: UNCONDITIONAL WAIVER FOR FINAL PAYMENT

* * * * * * *

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. IT IS PROHIBITED FOR A PERSON TO REQUIRE YOU TO SIGN THIS DOCUMENT IF YOU HAVE NOT BEEN PAID THE PAYMENT AMOUNT SET FORTH BELOW. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project:

Job No.:

The signer of this document has been paid in full for all labor, services, equipment, or materials furnished to the property or to_____
_____
(person with whom signer contracted) on the property of_____
_____
_____ (owner) located at_____
_____
_____ (location) to the following extent _____
_____
:_____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

--- THIS PAGE INTENTIONALLY BLANK ---

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« »

THE OWNER:
(Name, legal status and address)

« Eagle Mountain-Saginaw Independent School District
1200 Old Decatur Road
Fort Worth, TX 76179 »

THE CONTRACTOR:
(Name, legal status and address)

« »« »

THE ARCHITECT:
(Name, legal status and address)

« »« »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), all sections of the Project Manual and Construction Documents (as defined in §1.1.3 below) including Drawings, Specifications, and Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. ~~Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.~~ Any reference to Contract Documents herein shall include the Construction Documents, and any other documents included in the Contract Documents, as amended and/or supplemented for this Project.

§ 1.1.1.1 The Agreement, represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. Any revision, amendment, or modification to the Standard Form of the Agreement shall be valid, binding, and enforceable only if said revision, amendment or modification is made conspicuous by being underlined, lined-through, or highlighted in this Agreement signed by Contractor and the authorized representative of Owner's Board of Trustees. In the event of conflict, terms and conditions contained in the Agreement, shall take precedence over terms and conditions contained in the General Conditions, and the terms and conditions in the General Conditions, shall take precedence over all other terms and conditions contained in the other Contract Documents. If the Request for Proposals and the Proposal are included in the Contract Documents, then the Request for Proposals shall take precedence over the Proposal, unless specifically agreed otherwise herein.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification signed by Contractor, approved by Owner's Board of Trustees, and signed by the representative of the Owner's Board of Trustees who is authorized to sign contracts. As a material consideration for the making of the Contract, modifications to the Contract shall not be construed against the maker of said modifications. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. ~~The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.~~

§ 1.1.2.1 To be effective, all Contract Documents requiring signatures must be signed first by the Contractor and then by the Owner's authorized representative, after approval by Owner's Board of Trustees. If an approved Contract Document requiring Contractor's signature has not been signed, then the missing signature shall be provided within a reasonable period of time. Failure of Contractor to sign an approved Contract Document after notice and a reasonable opportunity to sign shall be considered a material breach of the Contract by Contractor.

§ 1.1.3 The Work; Construction Documents

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project. The Work includes all of Contractor's responsibilities as to all labor, parts, supplies, skill, supervision, transportation services, storage requirements, and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the Contract Documents and the Construction Documents and all other items of cost or value needed to produce, construct and fully complete the public Work identified by the Contract Documents and the Construction Documents. "Construction Documents" means: all Drawings, Specifications, geotechnical reports, Addenda, submittals, transmittals, deliverables, instructions to Contractors, and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants and which set forth in detail the

requirements for construction of the Project. The Construction Documents shall include Drawings and Specifications that establish in detail the quality levels of materials and systems required for the Project. The Construction Documents shall reflect all agreements between Owner and Architect concerning Owner's budgetary constraints, programmatic needs and expectations as to quality, functionality of systems, maintenance costs, and usable life of equipment and facilities. Said Construction Documents shall reflect the Owner's educational program and educational specifications, the State educational adequacy standards in 19 TAC Section 61.1036 and the standards set forth in Section 3.1.4 of AIA Document B101-2017. The Architect shall provide Construction Documents which are sufficient for Owner to complete construction of the Project, are free from material defects or omissions, and which shall comply with all applicable laws, ordinances, codes, rules, and regulations, as of the date of issuance of Construction Documents.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 ~~Instruments of Service~~Construction Documents

~~Instruments of Service~~Construction Documents ~~are~~include representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. ~~Instruments of Service~~ Construction Documents may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 ~~Initial Decision Maker~~

~~The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.~~

§ 1.1.9 Addenda

Addenda are written or graphic instruments issued prior to the execution of the Contract, which modify or interpret the bidding or proposal documents, including Drawings and Specifications, by additions, deletions, clarifications, or corrections. Addenda will become part of the Contract Documents and Construction Documents when the Agreement is executed. The Contractor and subcontractors shall include all addenda items on their copies of the Drawings and Specifications.

§ 1.1.10 All references to "Contractor" shall include "Construction Manager at Risk" as appropriate.

§ 1.1.11 The Owner may retain Program Manager(s) to carry out some of the functions of the administration of the Owner's construction program. The Contractor, Architect, and Program Manager (when applicable) shall cooperate with each other in the performance of their respective functions. The management and reporting systems used by the Owner and/or Program Manager, including the assignment of the Program Manager, may be changed by Owner during the Project.

§ 1.1.12 Approved, Approved Equal, Approved Equivalents, Or Equal

The terms "Approved" and "Approved Equal" relate to the substitution of materials, equipment, or procedure in writing by the Architect prior to receipt of bids.

§ 1.1.13 Abbreviations

AIA: American Institute of Architects. (All references to AIA documents refer to AIA's trademarked documents. Each reference to a specific document shall refer to the document as amended for this Project.)

AIEE: American Institute of Electrical Engineers
ACI: American Concrete Institute
AHERA: Asbestos Hazardous Emergency Response Act
AISI: American Iron and Steel Institute
AISC: American Institute of Steel Construction
ANSI: American National Standards Institute
ASA: American Standards Association
ASTM: American Society of Testing Materials
AWSC: American Welding Society Code
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
EPA: Environmental Protection Agency
FS: Federal Specification
NES: National Electrical Code
OSHA: Occupational Safety and Health Administration
SPR: Simplified Practice Recommendation
TAS: Texas Accessibility Standards
UL: Underwriters Laboratories, Inc.

§ 1.1.14 Bids or Bidding The terms "Bids" or "Bidding" shall include any kind of competitive purchasing under Texas Government Code Chapter 2269.

§ 1.1.15 Miscellaneous Other Words

§ 1.1.15.1 Business Day
The term "business day" is a day the Owner's Administration Building is scheduled to be open for normal business purposes, unless closed by the Owner's Superintendent of Schools for inclement weather or other reason. Days on which the Administration Building is normally closed are Thanksgiving Break, Winter Break, Spring Break, and Summer Break, as well as other federal, state or local days specified in the calendar approved by the Owner's Board of Trustees on an annual basis. A business day does not include a day on which the Owner's Administration Building is open only for the purposes of conducting candidate filing, early voting, elections, or other special events.

§ 1.1.15.2 Calendar Day
A calendar day is a day on the Gregorian Calendar. The Contract Time is established in calendar days. Extensions of time granted, if any, will be converted to calendar days.

§ 1.1.15.3 Holidays
Owner-approved holidays for Contractor's Work are limited to New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

§ 1.1.15.4 Work Day
Work days are all calendar days except Holidays.

§ 1.1.15.5 Anticipated Weather Days
An allowance of regular Work Days, established as anticipated Work Days lost due to weather delays; said allowance shall be included in Contractor's proposed completion time. Only lost weather days in excess of Anticipated Weather Days shall be considered by Owner for time extensions based upon weather. Section 15.1.5.3 lists required Anticipated Weather Days.

1.1.16 Contract Sum
"Contract Sum" shall have the same meaning as in Section 5.1 of the Agreement (A133-2009), for the Project when the Project is a Construction Manager at Risk Project, and the same meaning as in Article 4 of the Agreement (A101-2017) for the Project.

§ 1.2 Correlation and Intent of the Contract Documents
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent

consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 During the course of the Work, should any conflict be found in or between the Contract Documents, the Contractor shall be deemed to have estimated the Work on the basis of the greater quantity or better quality, or the most stringent requirement, unless he shall have obtained an interpretation in writing from the Architect as to what shall govern before the submission of his Proposal. The Architect, in case of such conflict, may interpret or construe the documents so as to obtain the most substantial and complete performance of the Work consistent with the Contract Documents and reasonably inferable therefrom, in the best interest of Owner, and the Architect's interpretation shall be final. The terms and conditions of this clause shall not relieve any party of any other obligation under the Contract Documents.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Relation Of Specifications And Drawings

General Requirements in the Specifications govern the execution of all Specifications. Summary paragraphs present a brief indication of the Work, but do not limit the Work as later detailed. The Drawings and Specifications are correlative and have equal authority and priority. Should the Drawings and Specifications have internal inconsistencies, then the Contractor shall base the bids and construction on the more expensive combination of quality and quantity of work indicated. For purposes of construction, the Architect shall determine the appropriate Work, after the Contractor brings the inconsistency to the Architect's attention. Failure to report an inconsistency shall be evidence that Contractor has elected to proceed in the more expensive manner.

§ 1.2.5 Materials, Equipment And Processes

Exact location and arrangement of the various pieces of equipment specified shall be determined with the approval of the Architect after equipment has been selected and/or as the Work progresses. All equipment shall, insofar as possible, be installed in such a manner as will not interfere with architectural or structural portions of the building. Should changes become necessary because of a failure of the Contractor to comply with the Contract Documents which results in equipment requiring more area then shown on the Contract Documents, the Contractor shall be fully responsible for completing any required modifications or eliminating any interferences. Where in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are specified, it is done for the express purpose of establishing a standard of function, dimension, appearance, and quality of design in harmony with the Work, and is not intended for the purpose of limiting competition. Materials or equipment shall not be substituted unless the Architect has specifically accepted such substitution for use on this Project. When more than one material, process, or brand is specified for a particular item of Work, the choice shall be the Contractor's. The final selection of color and pattern will be made by the Owner from the range available within the option selected by the Contractor, unless the item is specified to match a specific color or sample furnished. Where particular items are specified, products of those named manufacturers are required unless Contractor submits for consideration proposed substitutions of materials, equipment or processes from those set out in the Contract Documents. Submittals of proposed substitutions should contain sufficient information to allow the Architect and Owner to determine if the proposed substitution is in fact equal to or better than the requirements in the Contract Documents. The Architect shall review and respond to proposed substitutions within fifteen (15) days of receipt. Contractor shall bear all risk caused by submitting substitutions, including all costs. The Owner may approve substitutions only when the substitution is clearly provided by the Contract to be equal in performance characteristics to the requirements of the Contract Documents, equally compatible with the existing installations and complementary to the architectural design for the Work. Certain specified construction and equipment details may not be regularly included as part of

the named manufacturer's standard catalog equipment, but shall be obtained by the Contractor from the manufacturer as required for the proper evaluation and/or functioning of the equipment. Reasonable minor variations in equipment are expected and will be acceptable, if approved by the Architect and Owner, however, indicated and specified performance and material requirements are the minimum. The Owner and the Architect reserve the right to determine the equality of equipment and materials that deviate from any of the indicated and specified requirements.

§ 1.2.6 Standards And Requirements

When the Contract Documents refer to standards, building codes, manufacturers' instructions, or other documents, unless otherwise specified, then the current edition as of the date of execution of the Agreement by the last party to execute said Agreement shall apply. It shall be the responsibility of the Architect to address revisions or amendments to applicable codes or standards which arise after the date of execution of the Agreement and until Final Completion, pursuant to the terms of the Agreement between Owner and Architect. Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other ~~Instruments of Service~~Construction Documents

§ 1.5.1 ~~The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights.~~ All ownership rights, whether common law, statutory, or other reserved rights, including copyright ownership of the Construction Documents, are controlled by the Agreement between the Owner and the Architect. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the ~~Instruments of Service~~Construction Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any ~~the Architect's or Architect's consultants'~~ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are granted a limited license ~~authorized~~ to use and reproduce the ~~Instruments of Service~~Construction Documents provided to them, subject to any protocols established pursuant to Section~~s~~ 1.7~~, and 1.8,~~ solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the ~~Instruments of Service~~Construction Documents. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the ~~Instruments of Service~~Construction Documents on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants. All copies of the Construction Documents, except the Contractor's record set, shall be returned or suitably accounted for to the copyright holder upon completion of the Work.

§ 1.6 Notice~~Transmission of Data in Digital Form~~

~~If the parties intend to transmit Construction Documents or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.~~

§ 1.6.1 ~~Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.~~ Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice, or if sent by electronic facsimile transmission, to the last business number known to the party giving

notice, with electronic confirmation of receipt; or, if sent by electronic mail, to the email address of the Owner's or Contractor's designated representative, with electronic confirmation of receipt.

§ 1.6.2 ~~Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.~~

§ 1.7 Digital Data Use and Transmission

~~The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.~~ If the parties intend to transmit Construction Documents or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents

§ 1.8 ~~Building Information Models Use and Reliance~~

~~Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.~~

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the independent school district identified in the Contract Documents. ~~person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.~~ The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to: enter into a contract; amend a contract, including but not limited to AIA Document A-133 Exhibit A; approve changes in the scope of Work; approve and execute a Change Order or Construction Change Directive modifying the Contract Sum or Guaranteed Maximum Price; agree to an extension to the date of Substantial or Final Completion; or terminate a contract. The Board will act as soon as reasonably possible to avoid undue delays. The Board designates authorized representatives to act on its behalf for day-to-day operations under the Contract. Unless otherwise designated in the Contract Documents, Owner's authorized representative shall be the Superintendent of Schools, who may delegate responsibilities as appropriate. Owner's Board of Trustees hereby delegates to the Superintendent of Schools or designee the authority to approve changes to the Work where such changes are within the Owner's contingency or the Contractor's contingency, and which do not exceed $25,000, or will not increase the dates for Substantial or Final Completion by more than thirty (30) days. Any such change shall be confirmed in writing between the Contractor and Owner's Superintendent or designee, and notice of such approved changes shall be given to the Board at its next regular meeting. Except as otherwise provided in the Contract Documents, the Architect does not have such authority. Neither Architect nor Contractor may rely upon the direction of any employee of Owner who has not been designated in writing by the Superintendent or Board of Trustees; Owner shall not be financially responsible for actions taken by the Architect or Contractor in reliance upon direction from unauthorized persons.

§ 2.1.2 ~~The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.~~ It shall be distinctly understood that by virtue of this Contract, no mechanic, contractor, material person, artisan, or laborer, skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the buildings or any of the improvements of whatsoever nature or kind so erected or to be erected by virtue of this Contract or upon any of the land on which said buildings or any of the improvements are so erected, built, or situated, such property belonging to a political subdivision of the State of Texas. It shall be further understood that this Contract is not written for the benefit of third parties.

§ 2.1.3 The Owner shall require the Contractor and the Architect to meet periodically at mutually-agreed-upon intervals, for the purpose of establishing procedures to facilitate cooperation, communication, and timely responses among the participants. By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

§ 2.1.4 The Owner may require that the Contractor use and/or respond to certain Owner-furnished forms or inquiries during the course of the Project. From time to time, there may be future revisions, changes, additions or deletions to these forms. The fact that the Owner modifies and increases reasonable reporting requirements shall not serve as the basis for a claim for additional time or compensation by the Contractor.

§ 2.1.5 The Contractor stipulates and agrees that the Owner has no duty to discover any design errors or omissions in the Drawings, Plans, Specifications and other Construction Documents, and has no duty to notify Contractor of same. By entering into the Contract Documents or any Agreement with any Architect, Owner does not warrant the adequacy and accuracy of any Drawings, Plans, Specifications or other Construction Documents.

§ 2.2 ~~Evidence of the~~ Owner's Financial Arrangements

§ 2.2.1 ~~Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.~~ The Owner, being a public body under the laws of the State of Texas, must have adequate funds and/or financing as provided by law prior to award and execution of the Contract Documents.

§ 2.2.2 ~~Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.~~

§ 2.2.3 ~~After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~

§ 2.2.4 ~~Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.~~

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor ~~to whom the Contractor has no reasonable objection and~~ whose status under the Contract Documents shall be that of the Architect. Owner shall notify Contractor if a ~~new~~ successor ~~A~~architect has been employed by Owner.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. ~~The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.~~ Other than the metes and bounds noted in the survey, if any, Owner does not guarantee or warrant the accuracy of surveys provided, including the locations of utility lines, cables, pipes or pipelines, or the presence or absence of easements.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. ~~The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness~~ after receiving the Contractor's written request for such information or services. Absent such timely notification, any Claim based upon lack of such information or services shall be waived.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor at least one copy of the ~~Contract~~ Construction Documents, as provided for in the Project Manual, for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct defective Work, fails to correct Work that is not in accordance with the requirements of the Contract Documents or the Construction Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. The authorized Owner's representative having the legal right to stop the Work shall be limited to the Owner's Superintendent of Schools.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. ~~Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and t~~The Architect ~~may~~shall, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's and other consultants' additional services, if any, made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, then the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, then the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative, and includes the Construction Manager at Risk, if applicable.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, activities of the Owner (or Owner's Program Manager, if applicable), or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this Contract, which representations and warranties shall survive the execution and delivery of the Contract and the Final Completion of the Work:

.1 that it is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents;

.2 that it is able to furnish the tools, materials, supplies, equipment and labor required to timely complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;

.3 that it is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental, public, and quasi-public authorities having jurisdiction over it, the Work, or the site of the Project; and

.4 that the execution of the Contract and its performance thereof are within its duly-authorized powers.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor represents and warrants by submission of a Proposal that he has carefully examined the Contract Documents, any soil test reports, drainage studies, geotechnical or other reports and the site of the Work, and that, from his own investigations, he has satisfied himself as to the nature and location of the Work, the character, quality and quantity of surface and subsurface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, the general and local conditions and all other materials which may in any way affect the Work or its performance. Should the Contractor find discrepancies, omissions or conflicts within the Contract Documents, or be in doubt as to their meaning, the Contractor shall at once notify in writing the Architect and Owner, and Architect will issue a written addendum to all parties that is consistent with the Owner's Scope of the Work. The Contractor shall not be entitled to any additional time or compensation for Contractor's failure to visit the site, or for any additional Work caused by the Contractor's fault, by improper construction, or by Contractor's failure to visit the site or to carefully study and compare the Contract Documents prior to execution of the Work.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are ~~not~~ for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; ~~however,~~ the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. Contractor shall not perform any Work involving an error, inconsistency, or omission without further instructions to Contractor or revised Construction Documents from the Architect.

§ 3.2.3 Neither the Owner nor ~~T~~the Contractor is ~~not~~ required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public

authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the Work or to honor his warranty, or will result in a limitation of or interference with the Owner's intended use, then the Contractor shall promptly notify the Architect and Owner in writing, providing substantiation for his position. Any necessary changes, including substitution of materials, shall be accomplished by appropriate Modification. If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. Contractor shall take field measurements, verify field conditions, ad shall carefully compare them to the Construction Documents. ~~If the Contractor performs those obligations, T~~the Contractor shall ~~not~~ be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities when the Contractor recognized or should have recognized such error, inconsistency, omission or difference and failed to report it to the Architect. Contractor shall not be entitled to additional compensation for additional Work caused by Contractor's failure to carefully study and compare the Construction Documents prior to the execution of the Work.

§ 3.2.5 Prior to performing any Work, and only if applicable, Contractor shall locate all utility lines as shown and located on the plans and specifications, including telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, but not limited to, all buried pipelines and buried telephone cables, and shall perform any Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. In addition, Contractor shall independently determine the location of same. Contractor shall be responsible for any damage done to such utility lines, cables, pipes and pipelines during its Work, and shall be responsible for any loss, damage, or extra expense resulting from such damage. Repairs shall be made immediately to restore all service. Any delay for such break shall be attributable to Contractor. In addition, and only if applicable, Contractor shall review the appropriate AHERA and hazardous materials surveys for the particular campuses involved in the Project, and shall notify all Subcontractors and Sub-subcontractors of the necessity to review said surveys. Contractor shall perform any Work in such a manner as to avoid damaging, exposing, or dislodging any asbestos-containing materials that are clearly identified and located in AHERA and other hazardous material surveys. Before performing any portion of the Work, the Contractor shall fully investigate all physical aspects of the Project Site and verify all dimensions, measurements, property lines, grades and elevations, existing improvements, and general suitability of existing conditions at the Project site. If applicable, Contractor shall comply with U.S. Environmental Protection Agency rules concerning renovating, repairing, or painting work in schools built prior to 1978 involving lead-based paint.

§ 3.2.6 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation. If, in the reasonable opinion of the Architect, the Contractor does not make reasonable effort to comply with any of the above requirements of the Contract Documents and this causes the Architect or his Consultants to expend an unreasonable amount of time in the discharge of the duties imposed by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure.

§ 3.2.7 The Contractor shall arrange meetings prior to commencement of the Work of all major Subcontractors to allow the Subcontractors to demonstrate an understanding of the Construction and Contract Documents to the Architect and to allow the Subcontractors to ask for interpretations, when necessary. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including:

.1 The location, condition, layout, drainage and nature of the Project site and surrounding areas;
.2 Generally prevailing climatic conditions;

.3 Anticipated labor supply and costs;
.4 Availability and cost of materials, tools and equipment; and
.5 Other similar issues.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects in writing to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractor's employees, subcontractors, and all other persons carrying out the Contract. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, while on Owner's property, to refrain from committing any criminal conduct, using tobacco products, possessing or drinking alcoholic beverages, possessing or using illegal drugs or any controlled substance, carrying or possessing weapons, speaking profane and/or offensive language, or engaging in any inappropriate interactions of any nature whatsoever with students and employees, including talking, touching, staring or otherwise contributing to a hostile or offensive environment for Owner's students and employees. All areas of campus, other than the defined construction area, shall be off limits to Contractor's forces, unless their work assignment specifies otherwise. Contractor shall also require adequate and appropriate dress and identification of Contractor's employees, subcontractors, and all other persons carrying out the Work. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's full name in a typeface large enough to be seen from a reasonable distance. The Contractor shall further ensure that no on-site fraternization shall occur between personnel under the Contractor's and Subcontractor's direct or indirect supervision and Owner's students or employees and the general public. Failure of an individual to adhere to these standards of conduct shall result in the immediate removal of the offending employee from all construction on any of Owner's property. Repeated removal of Contractor's or Contractor's subcontractor's forces, or one serious infraction, shall constitute a substantial breach of the Agreement justifying the immediate termination by Owner pursuant to Article 14. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, to park their personal motor vehicles on Owner's property only in the parking places designated by the Owner's campus principal. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense. Contractor shall follow, and shall require all employees, agents or subcontractors to follow, the tree ordinance of the municipality in which the Project is located. In addition, if not covered by the municipal tree ordinance, Contractor shall barricade and protect all trees on the Project, which shall be included in the Cost of the Work. Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's subcontractor's forces' actions, omissions, or failure to secure the Work or connecting or adjacent property of Owner.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall properly and efficiently coordinate the timing, scheduling and routing of all Work performed by all sub-contractors and sub-sub-contractors.

§ 3.3.5 To the extent that any portion of the Work requires a trench excavation exceeding five (5) feet in depth, in accordance with Texas Health and Safety Code Section 756.023(a), Contractor shall fully comply, and shall require any applicable subcontractor to comply, with:

.1 The Occupational Safety and Health Administration standards for trench safety in effect for the Construction of the Work;

.2 The special shoring requirements, if any, of the Owner; and

.3 Any geotechnical information obtained by Owner for use by the Contractor in the design of the trench safety system.

.4 Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used.

§ 3.3.6 The Contractor shall review Subcontractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person or entity (e.g., a supplier), including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state, and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Paragraph are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws, including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration.

§ 3.3.7 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent contractor. Nothing contained in this Agreement or inferable from this Agreement shall be deemed or construed to: 1) make Contractor the agent, servant or employee of the Owner; or 2) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner or any of its authorized representatives in respect of the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent contractor status.

§ 3.3.8 Pursuant to Texas Labor Code Sec. 214.008, the Contractor and any subcontractor on the Project shall properly classify, as an employee or an independent contractor, in accordance with Texas Labor Code Chapter 201, any individual the Contractor or subcontractor directly retains and compensates for services performed in connection with this Agreement. Any Contractor or subcontractor who fails to properly classify such an individual may be subject to the penalties of Texas Labor Code Sec. 214.008(c).

§ 3.4 Labor and Materials

§ 3.4.1 These Contract Documents shall not be construed to deny or diminish the right of any person to work because of the person's membership or other relationship status with respect to any organization. Texas Government Code §2269.054. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for qualified, careful, and efficient workers and labor, eligible to work in accordance with state and federal law. Contractor shall appropriately classify all workers in accordance with the Fair Labor Standards Act, its implementing regulations, and Texas Labor Code Section 214.008. In addition, unless otherwise provided in the Contract documents, the Contractor shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Before ordering any material or doing any Work, Contractor shall verify all dimensions and check all conditions in order to assure Contractor that they are the same as those in the Drawings, Specifications, and other Construction Documents. Any inconsistency shall be brought to the attention of the Architect. In the event that

discrepancies occur between ordered material and actual conditions and Architect was not notified beforehand, then costs to correct such discrepancies shall be borne by Contractor.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the prior written consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 After evaluation by the Architect, substitutions and alternates may be rejected by the Architect without explanation and will be considered only under one or more of the following conditions: (i) the proposal is required for compliance with interpretation of code requirements or insurance regulations then existing; (ii) specified products are unavailable through no fault of the Contractor; (iii) and when, in the judgment of the Architect, a substitution would be substantially in the Owner's best interests, in terms of cost, time, or other considerations.

§ 3.4.2.2 The Contractor must submit to the Architect: (i) a full explanation of the proposed substitution and submittals of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation for the substitution; (ii) a written explanation of the reasons the substitution should be considered, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum; (iv) the adjustment, if any, in the time of completion of the Contract and the construction schedule; and (v) an affidavit stating (a) the proposed substitution conforms to and meets all requirements of the pertinent Specifications and the requirements shown on the Drawings, and (b) the Contractor accepts the warranty and will coordinate the Work to be complete in all respects, as if originally specified by the Architect. Proposals for substitutions shall be submitted in writing to the Architect in sufficient time to allow the Architect no less than fifteen (15) working days for review. No substitutions will be considered or allowed without the Contractor's submittals of complete substantiating data and information.

§ 3.4.2.3 Whether or not the Architect accepts any proposed substitution, the Contractor shall reimburse the Owner for any fees charged by the Architect or other consultants for evaluating each proposed substitution.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. THE CONTRACTOR RELEASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES, CONTRACTOR'S FORCES' NON-COMPLIANCE WITH CRIMINAL LAW, OR CONTRACTOR'S OR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH IMMIGRATION LAW OR REGULATIONS. Any individual found by Owner to have violated these restrictions is subject to permanent removal from the Project, at Owner's request. Contractor shall place similar language in its subcontract agreements, requiring its Subcontractors and Sub-subcontractors to be responsible for their own forces and Contractor shall cooperate with the Owner to ensure Subcontractor and Sub-subcontractor compliance.

§ 3.4.4 Including, but not limited to, the specific requirements of Article 10, Contractor, its subcontractors and vendors shall bear responsibility for compliance with all federal, state and local laws, regulations, guidelines, and ordinances pertaining to worker safety and applicable to the Work. Contractor further recognizes that the Owner and Architect do not owe the Contractor any duty to supervise or direct his work so as to protect the Contractor from the consequences of his own conduct.

§ 3.4.5 Pursuant to Texas Education Code Section 44.034, Contractor must give advance written notice to the Owner if the Contractor or an owner or operator of the Contractor has been convicted of a felony. The Owner may terminate this Agreement if the Owner determines that the Contractor failed to give such notice or misrepresented the conduct resulting in the conviction. This paragraph requiring advance notice does not apply to a publicly-held corporation.

§ 3.4.6 CRIMINAL HISTORY CHECKS

§ 3.4.6.1 Contractor shall obtain all criminal history information required by Texas Education Code Chapter 22 regarding its "covered employees", as defined below. If Contractor is required by Chapter 22 to obtain the information from the Fingerprint-based Applicant Clearinghouse of Texas, then Contractor will also subscribe to that person's criminal history record information. Before beginning any Work on the Project, Contractor will provide written certification to the District that Contractor has complied with the statutory requirements as of that date. Upon request by Owner, Contractor will provide, in writing: updated certifications and the names and any other requested information regarding covered employees, so that the Owner may obtain criminal history record information on the covered employees. Contractor shall assume all expenses associated with obtaining criminal history record information.

§ 3.4.6.2 Contractor will not assign any "covered employee" with a "disqualifying criminal history", as those terms are defined below, to work on the Project. If Contractor receives information that a covered employee has a reported disqualifying criminal history, then Contractor will immediately remove the covered employee from the Project and notify the Owner in writing within three business days. If the Owner objects to the assignment of any covered employee on the basis of the covered employee's criminal history record information, then Contractor agrees to discontinue using that covered employee to provide services on Owner's Project. If Contractor has taken precautions or imposed conditions to ensure that the employees of Contractor and any subcontractor will not become covered employees, Contractor will ensure that these precautions or conditions continue throughout the time the contracted services are provided.

§ 3.4.6.3 For the purposes of this Section, "covered employees" means employees, agents or applicants of Contractor who has or will have continuing duties related to the services to be performed on Owner's Project and has or will have direct contact with Owner's students. The Owner will decide what constitutes direct contact with Owner's students. "Disqualifying criminal history" means: any conviction or other criminal history information designated by the Owner; any felony or misdemeanor conviction that would disqualify a person from obtaining educator certification under Texas Education Code Section 21.060 and 19 Texas Administrative Code §249.16; or one of the following offenses, if at the time of the offense, the victim was under 18 years of age or enrolled in a public school: a felony offense under Texas Penal Code Title 5 Offenses Against Persons; an offense for which a defendant is required to register as a sex offender under Texas Code of Criminal Procedure Chapter 62; or an equivalent offense under federal law or the laws of another state.

§3.4.6.4 Subcontractors or any subcontractor entity, as defined by Texas Education Code §22.08341(a)(3), shall be required by the terms of their contract with Contractor or any other contracting entity (as defined in Texas Education Code §22.08341(a)(1)), and by Texas law, to obtain the required criminal history record information on their employees, agents, or applicants, to give required certifications to Owner and the contracting entities, and to obtain required certifications from the subcontracting entity's subcontractors.

§3.4.6.5 On request of Owner, Contractor shall provide all necessary identifying information to allow Owner to obtain criminal history record information for covered employees of the Contractor and all subcontractors. Contractor shall update this list on Owner's request.

§ 3.4.7 OWNER'S ADDITIONAL REQUIREMENTS RELATED TO CRIMINAL HISTORIES

In addition, Contractor will at least annually obtain criminal history record information that relates to any employee, agent, or applicant of the Contractor, if the person has or will have duties related to the Project, and the duties are or will be performed on Owner's Project, or at another location where students are likely to be present. Contractor shall assume all expenses associated with the background checks and shall immediately remove any employee, agent or subcontractor who was convicted of a felony or a misdemeanor involving moral turpitude from Owner's property, or other location where students are likely to be present. Owner shall determine what constitutes "moral turpitude" or a "location where students are likely to be present."

§ 3.4.8 PREVAILING WAGE RATES

§ 3.4.8.1 Contractor, Contractor's Subcontractors and Sub-subcontractors shall pay all workers not less than the general prevailing rate of per diem wages for work of a similar character where the Project is located, as detailed in the "Minimum Wage Schedule" attached to this Agreement. Wages listed are minimum rates only. However, no claims for additional compensation above the Contract Sum shall be considered by the Owner because of payments of wage rates in excess of the applicable rate provided herein. Texas Government Code Section 2258.001 *et seq.*

§ 3.4.8.2 Contractor shall forfeit, as a penalty to the Owner, $60 for each laborer, worker or mechanic employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the Contract Documents.

§ 3.4.8.3 Owner reserves the right to receive and review payroll records, payment records, and earning statements of employees of Contractor, and of Contractor's Subcontractors and Sub-subcontractors.

§ 3.4.8.4 In executing the Work under the Contract Documents, Contractor shall comply with all applicable state and federal laws, including but not limited to, laws concerned with labor, equal employment opportunity, safety and minimum wages.

§ 3.4.8.5 If no schedule is attached, then the parties shall use the wage rate determined by the US Department of Labor in accordance with the Davis-Bacon Act, 40 USC Section 276a, which can be accessed on the internet at www.gpo.gov/davisbacon.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. The Contractor further warrants that Contractor shall perform the Work in a good and workmanlike manner, continuously and diligently in accordance with generally accepted standards of construction practice for construction of projects similar to the Project, except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship, in which case the standard shall be the higher standard. All material shall be installed in a true and straight alignment, level and plumb; patterns shall be uniform; and jointing of materials shall be flush and level, unless otherwise directed in writing by the Architect. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance (unless such maintenance is Contractor's responsibility), , improper operation, or normal wear and tear and normal usage, but such exclusions shall only apply after Owner has taken occupancy of the damaged or defective portion of the Project. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Notwithstanding anything in the Contract Documents to the contrary, Owner and Contractor expressly agree that the warranties stated herein shall mean the individual warranties associated with each particular Work within the Project, and each such individual warranty shall run from the applicable Work's Final Completion date (unless otherwise expressly provided in the applicable Contract Documents for that particular Work). Contractor's express warranty is in addition to, and not in lieu of, Owner's other available remedies. All required warranties on equipment, machinery, materials, or components shall be submitted to the Architect on the manufacturer's or supplier's approved forms for delivery to the Owner. The warranties set out in this Subparagraph are not exclusive of any other warranties or guarantees set out in other places in the Contract Documents or expressed or implied under applicable law.

§ 3.5.2 ~~All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.~~ Contractor shall certify that the Project has been constructed in general conformance with the Architect's or Engineer's plans, specifications, and Construction Documents, as modified from time to time pursuant to the terms of the Contract Documents. Contractor shall fully complete a "Certification of Project Completion" as required by 19 Texas Administrative Code Section 61.1036.

§ 3.5.3 In the event of failure of materials, products, or workmanship, either during construction or the warranty period, the Contractor shall take appropriate measures to ensure correction of defective Work or replacement of the defective items, without cost to the Owner. Such warranty shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the Project. Upon written notice from the Owner or Architect, the Contractor shall promptly remedy defects as covered by Contractor's warranty. If Contractor does not respond to the written notice, either by beginning corrective work or notifying Owner in writing regarding when corrective work will begin, within ten days of Contractor's receipt of the written notice, then the Owner may take measures to correct the Work and Contractor will be obligated to

reimburse Owner's costs. The provisions of this subparagraph shall be in addition to, and not in lieu of, any other rights and remedies available to the Owner.

§ 3.5.4 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of:

.1 an affidavit from the manufacturer certifying that the item is in conformance with the applicable standards; or

.2 an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standards; or

.3 such further reasonable proof as is required by the Architect.

§ 3.5.5 The Contractor agrees to issue in the name of the owner, or assign to the Owner at Final Completion of the Work, such assignment to be effective no later than Final Completion, any and all material, equipment, fixtures and furniture (if supplied or installed by Contractor or its subcontractors), other special warranties, and manufacturers' warranties relating to materials and labor used in the Work. Contractor further agrees to perform the Work in such manner so as to preserve any and all manufacturers' warranties. All forms will be required to be submitted prior to Final Payment.

§ 3.5.6 The warranties of Contractor provided in Subparagraphs 3.5.1, 3.5.2, and 3.5.3 shall in no way limit or abridge the warranties of the suppliers of equipment and systems which are to comprise a portion of the Work and all such warranties shall be in form and substance as required by the Contract Documents. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations.

§ 3.5.7 Contractor shall maintain a complete and accurate schedule of the date(s) of Substantial Completion, the date(s) of Final Completion, and the dates upon which the warranty under Section 12.2 herein on each phase or building will expire. Contractor shall provide a copy of such schedules to Owner and Architect. Prior to termination of the warranty period under Section 12.2 herein, Contractor shall accompany Owner and Architect on re-inspection of each Work in the Project and Contractor shall be responsible for correcting any warranty items which are observed or reported during the warranty period under Section 12.2 herein. Contractor shall prosecute such warranty work under Section 12.2 herein without interruption until accepted by Owner and Architect, even though such work should extend beyond the warranty period under Section 12.2 herein. If Contractor fails to provide the schedules to Owner and Architect, Contractor's warranty obligation described herein shall continue until such inspection is conducted and deficiencies are corrected.

§ 3.5.8 Prior to receipt of Final Payment, Contractor shall:

.1 Obtain duplicate original warranties, executed by all subcontractors, making the dates of beginning of the warranties the Date of Final Completion; and the warranties of suppliers and manufacturers, making the dates of beginning of the warranties no later than the Date of Final Completion;

.2 Verify that the documents are in proper form and contain full information;

.3 Co-sign warranties when required;

.4 Bind all warranties in commercial quality 8-1/2 X 11 inch three-ring binder, with hardback, cleanable, plastic covers;

.5 Label the cover of each binder with a typed or printed title labeled "WARRANTIES", along with the title of the Project; name, address and telephone number of Contractor; and name of its responsible principal;

.6 Include a Table of Contents, with each item identified by the number and title of the specification section under which the product is specified; and

.7 Separate each warranty with index tab sheets keyed to the Table of Contents listing.

.8 Deliver warranties and bonds in the form described above, to the Architect who will review same prior to submission to the Owner.

§ 3.6 Taxes

~~The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.~~ Owner is an exempt entity under the tax laws of the State of Texas. Texas Tax Code §151.309; 34 TAC §3.322. The Owner represents that this Project is eligible for exemption from the State Sales Tax on tangible personal property and material incorporated in the Project, provided that the Contractor fulfills the requirements of the Texas Tax Code §151.309, §151.310, §151.311 and 34 TAC §3.291; 3.287. For the purpose of establishing exemption, it is understood and agreed that the Contractor may be required to segregate materials and labor costs at the time a Contract is awarded. Contractor will accept a Certificate of Exemption from the Owner, pursuant to Texas Tax Code §151.054(e); §151.155; and 34 TAC §3.287. Contractor shall obtain Certificates of Resale from Contractor's suppliers. Texas Tax Code §151.154, 34 TAC §3.285. Failure of Contractor or any Sub-Contractor to obtain Certificates of Resale from their suppliers shall make the Contractor or Sub-Contractor responsible for absorbing the tax, without compensation from Owner. Contractor shall pay all necessary local, county and state taxes, income tax, compensation tax, social security and withholding payments as required by law. CONTRACTOR HEREBY RELEASES, INDEMNIFIES, AND HOLDS HARMLESS OWNER FROM ANY AND ALL CLAIMS AND DEMANDS MADE AS A RESULT OF THE FAILURE OF CONTRACTOR OR ANY SUBCONTRACTOR TO COMPLY WITH THE PROVISIONS OF ANY OR ALL SUCH LAWS AND REGULATIONS.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 ~~Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.~~ After Architect has filed the plans and specifications with the Texas Department of Licensing and Regulation, Architect shall notify Contractor that Contractor may make and submit the applications for the building permit. The Owner shall pay the municipality directly for the building permit and all other development "impact" fees, if any. The Contractor shall continue to be responsible for payment of other permits, governmental fees, licenses, and inspections necessary for proper execution of the Contract and which are legally required when bids or proposals are received. Such fees and expenses shall only be reimbursable to Contractor if expressly agreed to herein.

§ 3.7.1.1 The Owner shall pay directly to the governing authority the cost of all permanent property utility assessments and similar connection charges.

§ 3.7.1.2 The Contractor shall pay directly all temporary utility charges, tap charges, and water meter charges, without reimbursement from Owner. After consultation with the Owner, the Contractor shall also obtain all permits and approvals, and pay all fees and expenses, if any, associated with National Pollutant Discharge Elimination System (NPDES) regulations administered by the Environmental Protection Agency (EPA) and local authorities, if applicable, that require completion of documentation and/or acquisition of a "Land Disturbing Activities Permit" for the Project. Also after consultation with the Owner, the Contractor shall obtain all permits and approvals, and pay all fees and expenses, if any, associated with Storm Water Pollution Prevention and Pollution Control Plan (SWPPP) regulations administered by the Texas Commission on Environmental Quality (TCEQ) and local authorities. Contractor's obligations under this Section may or may not require it to obtain or perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites. Any drainage alterations made by Contractor during the construction process, which require the issuance of a permit, shall be at Contractor's sole cost. Reimbursable expenses shall not include any fines or penalties assessed against the Contractor, Contractor's subcontractors, the Project, or the Owner.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. . In addition, Contractor shall authorize posting of any notices concerning the Workers Compensation insurance carried by other parties involved in the Project, including without limitation, Architect, at the same location where Contractor posts notices regarding Workers Compensation. If applicable, the Contractor shall procure and obtain all bonds required of the Owner or the Contractor by the municipality in which the Project is located or by any other public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary back-up material and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closings, traffic control, parking meter removal and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

§ 3.7.3 If the Contractor performs Work ~~knowing~~ when Contractor knows or reasonably should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, , the Contract Documents, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than three (3) business~~14~~ days after first observance of the conditions. Contractor agrees that this is a reasonable notice requirement.- The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and report findings and a recommended resolution in writing to Owner and Contractor. If Owner's Board of Trustees and Contractor cannot agree on an equitable adjustment to the Contract Sum or Contract time, then either party may pursue alternative dispute resolution as provided for in Article 15 within ninety (90) days of the Architect's recommendation.. cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. ~~If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.~~

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect in writing. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of services to the Project. The Contractor shall inform the Architect at once when the Owner's participation is required, and the Architect shall immediately notify the Owner. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work, whether the Work is new construction or renovation of an existing facility, are the responsibility of the Contractor unless otherwise agreed. If the Work is new construction, then payment for temporary and/or permanent utility services shall be the responsibility of the Contractor until Substantial Completion.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection, unless required to do so by the terms of the Construction Documents.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site ~~and all required taxes~~, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum , unless required to do so by the terms of the Construction Documents, shall be adjusted accordingly ~~by Change Order~~. The amount of the adjustment ~~Change Order~~ shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.8.4 When performing Work under allowances, Contractor shall solicit and receive not less than three written proposals and shall provide the Work as directed by the Architect, upon Owner's written approval, on the basis of the best value to the District.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during performance of the Work. In addition, the Contractor may employ a project manager and necessary assistants who may supervise several Project sites. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be similarly confirmed in writing. Other communications shall be similarly confirmed on written request in each case. Questions about plan interpretation or directions shall be submitted to the Architect in the form of a written request for information and the Architect shall respond to such request for information in a reasonable and timely fashion. Contractor's selection of project manager or superintendent(s) shall be approved by Owner, and Contractor shall not replace the project manager or superintendent(s) without Owner's consent or until a replacement project manager or superintendent(s) has been selected in accordance with this Section. The Owner may reject or require removal of any job superintendent, project manager or employee of the Contractor, Subcontractor or Sub-Subcontractor involved in the Project. Contractor shall provide an adequate staff for the proper coordination and expedition of the Work. Owner reserves the right to require Contractor to dismiss from the Work any employee or employees that Owner may deem incompetent, careless, insubordinate, or in violation of any provision in these Contract Documents. This provision is applicable to Subcontractors, Sub-Subcontractors and their employees.

§ 3.9.2 ~~The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14 day period shall constitute notice of no reasonable objection.~~ Contractor's superintendent shall be present full-time on the site as soon as possible after commencement of the Work, and shall remain assigned to this Work, and present on the site, throughout the course of the Work until items requiring completion or correction, identified at Substantial Completion pursuant to Paragraph 9.8, have been completed or corrected. From Substantial Completion until Final Completion, the superintendent shall be on the site as necessary to ensure that Final Completion occurs within 30 days of Substantial Completion.

§ 3.9.3 ~~The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.~~ Contractor's superintendent shall be present full-time on the site as soon as possible after commencement of the Work, and shall remain assigned to this Work, and present on the site, throughout the course of the Work until items requiring completion or correction, identified at Substantial Completion pursuant to Section 9.8, have been completed or corrected. From Substantial Completion until Final Completion, the superintendent shall be on the site as necessary to ensure that Final Completion occurs within 30 days of Substantial Completion.

§ 3.9.4 Owner shall be notified not less than 24 hours before any time that superintendent will not be present at the site for any reason except periodic illness. If the reason is due to illness, then Owner shall be notified at the beginning of that day. Owner shall be notified of the identity of the acting superintendent. In the event the superintendent is absent from the site and notice has not been provided nor has an acting superintendent been assigned to the Work, then an amount equal to the superintendent's daily rate shall be deducted from the amount owed to the Contractor under general conditions for such day.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The schedule shall not interfere with the operation of Owner's existing facilities and operations without Owner's prior written approval.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall prepare and submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in ~~general~~ accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The Contractor shall hold weekly progress meetings at the Project Site, or at such other time and frequency as are acceptable to the Owner. Progress of the work shall be reported at said meetings with reference to Contractor's construction schedule. The Contractor shall submit to the Architect with each monthly application for payment a copy of the progress schedule showing all modifications required, and shall take whatever corrective action is necessary to assure that the project completion schedule is met at no additional cost to Owner, except as allowed herein. In the event that Contractor shall fall behind schedule at any time, Contractor shall develop and deliver a recovery plan to the Owner with a recovery schedule and a program describing the additional manpower, overtime, material expediting, resequencing of the Work and other steps Contractor shall take to meet the requirements of the Contract. Contractor shall not be entitled to compensation from the Owner or any increase in the Contract Sum for the schedule recovery efforts. No approval or consent by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor shall constitute a waiver by Owner of any damages or losses which Owner may suffer by reason of such resequencing or the failure of Contractor to meet the Substantial Completion Date or the Final Completion Date.

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain and make available at all times, at the Project site, the ~~Contract~~ Construction Documents, including Change Orders, Construction Change Directives, field test records (including environmental inspection and test records), inspection certificates or records, manufacturers' certificates, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner at all times, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.2 In addition to any other requirement in the Contract Documents and prior to installation, Contractor shall furnish or cause a subcontractor to furnish, for the Owner's and Architect's written approval, a physical sample of each specified item, product, fixture, or device which is visible by the general public and/or attached to an architecturally-finished surface. Samples shall be suitably labeled, adequately protected, and properly stored at the site. Samples which are approved and undamaged will be considered to be suitable for incorporation into the Work.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the ~~information given and the design concept expressed in the~~ Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. Specific dimensions, quantities, installation and performance of equipment and systems in compliance with the Construction Documents and the Contract Documents remain the Contractor's responsibility.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. ~~The Contractor shall be entitled to rely~~

~~upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents.~~ The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, completeness, and accuracy of the services, certifications, and approvals performed or provided by such design professionals., ~~provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy.~~ Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents~~.~~. A registered architect must prepare plans and specifications for all the Work, as governed by the Texas Occupations Code Chapter 1051; and a registered engineer must prepare plans, specifications and estimates for all Work governed by Texas Occupations Code Chapter 1001. In the event that Contractor retains a licensed design professional under the terms of this paragraph, Contractor shall require that the licensed design professional carry commercial general liability and errors and omissions insurance coverage in the same amounts and forms as required of the Architect on this Project. In the event that the licensed design professional retained by the Contractor will be conducting on-site services or observations, the licensed design professional shall also carry worker's compensation insurance and comprehensive automobile liability in the same amounts and forms as required of the Architect on this Project.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Contractor shall submit complete drawings, data and samples to the Architect at least fifteen (15) days prior to the date the Contractor needs the reviewed submittals and samples returned. The Contractor shall be prepared to submit color samples on any key items (such as quarry tile, vinyl wall covering, etc.) within fifteen (15) days of the award of Subcontract(s). All color samples required for the Work shall be received within sixty (60) days of the date of the approval of the Contract Sum if the Project is an A101 project, or Guaranteed Maximum Price if the Project is an A133 project. Once samples of all key items are received, the Architect will finalize color selections.

§ 3.12.12 The Contractor shall submit the number of copies of product data and samples which the Contractor and subcontractors need for their use, plus two additional sets for the Architect, one additional set for the Owner and one additional set for each of the Architect's consultants involved with the particular section of Work. Where shop drawings are involved, the Contractor shall submit one high quality reproducible transparency and one opaque print of the shop drawing for the Architect, plus one additional opaque print for each of the Architect's consultants involved with the particular section of Work. The reproducible transparency will be marked by the Architect and/or his consultants. After final review and correction of the submittal, the Contractor shall send one corrected set to the Architect and each of the Architect's consultants involved with the particular section of Work.

§ 3.12.13 The Architect's review of Contractor's submittals shall be limited to examination of an initial submittal and one (1) re-submittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to reimbursement from the Contractor of amounts paid to the Architect for evaluation of such additional re-submittals.

§ 3.12.14 The Contractor represents and warrants that all shop drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the shop drawings are prepared and, if required by the Architect or applicable law, by a licensed engineer.

§ 3.13 Use of Site

§3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed

from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and its subcontractors shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords Owner reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed in such a manner that public areas adjacent to the Site of the Work shall be free from all debris, building material and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Construction Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of any area or building adjacent to the site of the Work, or the building, in the event of partial occupancy.

§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrance and parking areas other than those designated by the Owner. The Contractor shall comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, provided, however, that any such cutting, fitting or patching can only be performed if the cutting, fitting or patching results in Work that is in accordance with the Construction Documents and Contract Documents. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.14.3 No cutting of structural elements will be permitted unless specifically approved in writing by Architect. Fitting and patching shall only be done with new products, and shall only performed by those skilled in performing the original Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall, on a daily basis, keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall provide on-site containers for the collection of waste materials, debris and rubbish, and shall periodically remove waste materials, debris and rubbish from the Work and dispose of all such materials at legal disposal areas away from the site. All cleaning operations shall be scheduled so as to ensure that contaminants resulting from the cleaning process will not fall on newly-coated or newly-painted surfaces. Immediately after unpacking materials, all packing case lumber or other packing materials, wrapping or other like flammable waste shall be collected and removed from the building and premises. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. . Care shall be taken by all workers not to mark, soil, or otherwise deface any finish. In the event that any finish becomes defaced in any way by mechanics or workers, the Contractor or any of his Subcontractors shall clean and restore such surfaces to their original condition.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 The Contractor shall be responsible for the protection of the Work. Prior to the Architect's inspection for Substantial Completion, the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, putty, soil, paint and foreign substances from all surfaces, including glass and painted surfaces; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in

mechanical equipment; clean roofs, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site; clean and polish all floors; clean and polish all hardware; and repair all Work damaged during cleaning.

§ 3.15.4 After construction is complete, Contractor shall: (1) employ skilled workers for final cleaning; (2) remove grease, mastic adhesive, dust, dirt, stains, fingerprints, labels and other foreign materials from all sight-exposed interior and exterior surfaces; (3) wash and shine glazing and mirrors; (4) polish glossy surfaces to a clear shine; (5) vacuum clean carpeted and similar soft surfaces; (6) clean (damp mop with clean mop and water) resilient and hard surface floors repeating as necessary until no visible residue remains on floors; (7) clean plumbing fixtures to a sanitary condition; (8) clean surfaces of all equipment and remove excess lubrication; (9) clean permanent filters and replace disposable filters in ventilating systems if units were operated during construction and clean ducts, blowers and coils; (10) clean light fixtures; (11) remove waste, foreign matter and debris from roofs, gutters, area ways and drainage ways; (12) remove waste, debris and surplus materials from the site; (13) remove stains, spills and foreign substances from paved areas; and (14) broom clean exterior concrete and paved surfaces and rake clean the grounds.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect and their designated representatives with access to the Work in preparation and progress wherever located. The presence of the Owner, Architect or their representatives does not constitute acceptance or approval of the Work.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. THE CONTRACTOR SHALL DEFEND SUITS OR CLAIMS FOR INFRINGEMENT OF COPYRIGHTS AND PATENT RIGHTS, SHALL WAIVE AND RELEASE CLAIMS AGAINST THE OWNER AND ARCHITECT, AND SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER AND ARCHITECT FROM LOSS ON ACCOUNT THEREOF, PROVIDED, HOWEVER, CONTRACTOR SHALL NOT BE RESPONSIBLE TO ARCHITECT FOR SUCH DEFENSE OR LOSS WHEN A PARTICULAR DESIGN, PROCESS OR PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS REQUIRED BY THE CONTRACT DOCUMENTS, OR WHERE THE COPYRIGHT VIOLATIONS ARE CONTAINED IN DRAWINGS, SPECIFICATIONS OR OTHER DOCUMENTS PREPARED BY THE ARCHITECT, AND SHALL NOT BE RESPONSIBLE TO OWNER IF OWNER REQUIRES A PARTICULAR DESIGN, PROCESS OR PRODUCT THAT CONSTITUTES A COPYRIGHT VIOLATION. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Owner and Architect in writing. ~~The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.~~

§ 3.18 Indemnification

§ 3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL WAIVE AND RELEASE CLAIMS AGAINST AND SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER, ARCHITECT, OWNER'S TRUSTEES, ARCHITECT'S CONSULTANTS, OWNER'S CONSULTANTS AND OFFICERS, AGENTS AND EMPLOYEES OF ANY OF THEM, FROM AND AGAINST CLAIMS, DAMAGES, LOSSES, CAUSES OF ACTION, SUITS, JUDGMENTS AND EXPENSES, INCLUDING BUT NOT LIMITED TO ATTORNEYS' FEES, ARISING OUT OF OR RESULTING FROM PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS OR EXPENSE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (INCLUDING THE WORK ITSELF) INCLUDING LOSS OF USE RESULTING THEREFROM, BUT ONLY TO THE EXTENT CAUSED IN WHOLE OR IN PART BY WILLFUL OR NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, A SUB-CONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, ANYONE THEY CONTROL OR EXERCISE CONTROL OVER, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS OR EXPENSE IS CAUSED IN PART BY ANY WILLFUL OR NEGLIGENT ACTS OR OMISSIONS OF OWNER OR OWNER'S CONSULTANTS OR OTHER INDEMNIFIED PARTIES. SUCH OBLIGATION

SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE, OR REDUCE OTHER RIGHTS OR OBLIGATIONS OF INDEMNITY THAT WOULD OTHERWISE EXIST AS TO A PARTY OR PERSON DESCRIBED IN THIS SECTION 3.18. ALL COSTS AND EXPENSES SO INCURRED BY ANY OF THE INDEMNIFIED PARTIES IN THAT EVENT SHALL BE REIMBURSED BY CONTRACTOR TO THE INDEMNIFIED PARTIES, AND ANY COST AND EXPENSES SO INCURRED BY INDEMNIFIED PARTIES SHALL BEAR INTEREST UNTIL REIMBURSED BY CONTRACTOR, AT THE RATE OF INTEREST PROVIDED TO BE PAID BY THE JUDGMENT UNDER THE LAWS OF THE STATE OF TEXAS.

§ 3.18.2 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER THIS SECTION 3.18 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.3 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER THIS SECTION 3.18 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.4 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER THIS SECTION 3.18 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.5 THE PROVISIONS OF SECTION 3.18 IN ITS ENTIRETY SHALL SURVIVE THE COMPLETION, TERMINATION OR EXPIRATION OF THIS CONTRACT.

~~To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.~~

§ 3.18.2 ~~In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.~~

§ 3.19 ANTITRUST VIOLATION. To permit the Owner to recover damages suffered in antitrust violations, Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which violate the antitrust laws of the United States, 15 U.S.C.A. Section 1 et seq. The Contractor shall include this provision in its agreements with each subcontractor and supplier. Each subcontractor shall include such provisions in agreements with sub-subcontractors and suppliers.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner., ~~Contractor, and Architect. Consent shall not be unreasonably withheld.~~

§ 4.1.3 Except as expressly provided herein, the Contractor shall not be relieved of Contractor's obligation to perform the Work in strict accordance with the Construction Documents and the Contract Documents by the duties, responsibilities, or activities of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction, until ~~the date the Architect issues the~~ final payment is due, and, with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.2.2. ~~Certificate for Payment.~~ The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, or as they may be amended in the future~~.~~

§ 4.2.2 ~~The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.~~ Architect shall visit the site at least twice per week (or more per week when deemed necessary by the Owner's Superintendent or when necessary to protect Owner's interests) and at other intervals appropriate to the stage of construction, to inspect the progress, quantity and quality of the work completed, to reject any observed nonconforming Work, and to determine if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Construction Documents and the Contract Documents and on time. Furthermore, a minimum of two job site meetings per month from commencement of construction through Final Completion will be initiated by the Architect and attended by the Contractor. Attendees will include the Owner, the Contractor's project manager and/or superintendent, Architect's project representative, and Architect. The Architect, Owner and their representatives shall at all times have access to the Work. Architect or its structural consultant will provide on-site observations prior to and during all concrete pours that contribute to the structural integrity of the building, including all pours of concrete piers, footings, grade beams, floor slabs, and concrete superstructure components, if applicable. In addition, Architect or its structural consultant will provide on-site observations prior to covering up or closing up of portions of the construction which, if covered, would conceal problems with the structural integrity of the Project. Contractor shall not close or cover said Work until said observations have occurred. Contractor or Architect will advise Owner of the need for any third-party laboratory or testing services to assist the Architect and Owner. On the basis of the on-site observations by Architect, Architect shall keep Owner and Contractor informed of the progress and quality of the Work, through Architect's field reports, and shall guard Owner against defects and deficiencies in the Work. Architect shall promptly notify Owner and Contractor orally regarding any defect or nonconforming Work, which shall be followed by notice in writing of defects or nonconforming Work noted and corrective actions taken or recommended. The Architect, however, shall not have control over or responsibility for the Contractor's construction means, methods, techniques, sequences, procedures, or safety programs, but this does not relieve Architect of Architect's responsibilities under this Agreement. Any services by Contractor made necessary by Contractor's construction defect or nonconforming Work shall be performed at no additional cost to Owner.

§ 4.2.3 ~~On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work.~~ The Architect will not be responsible for the Contractor's

failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect, or request of the Contractor.

§ 4.2.4 Communications

~~The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities . The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project.~~ Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. However, Owner reserves the right to communicate directly with the Contractor and Subcontractors. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. ~~The Contract Documents may specify other communication protocols.~~

§ 4.2.5 As further provided in the Contract Documents, b~~B~~ased on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect ~~has authority to~~ shall reject Work that does not conform to the Construction Documents and the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect ~~will have authority to require~~ will recommend to Owner additional inspection or testing of the Work in accordance with ~~Sections 13.4.2 and 13.4.3~~ the provisions of the Contract Documents, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Owner to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work. Architect and/or Contractor shall promptly notify, orally and in writing, the other party and Owner of any fault or defect in the Project or nonconformance with Construction Documents or the Contract Documents they may respectively discover and each, upon discovery of the defect or nonconformance, shall be responsible for notifying the other party and Owner of those corrective actions they respectively take; provided, however, Contractor shall have no duty to notify Owner of discoveries made or actions taken by Architect. Testing or inspections required by this subparagraph shall be conducted subject to the requirements of Chapter 2269 of the Texas Government Code.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Construction Documents and the Contract Documents. The Architect's action will be taken ~~in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with~~ such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or Separate Contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation ~~or performance~~ of equipment or systems, ~~all of which~~ remain the responsibility of the Contractor as required by the Construction Documents and the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. If any submittal does not comply with the requirements of the Construction Documents or the Contract Documents, then Architect shall require Contractor to come into compliance. The Architect shall promptly report in writing to the Contractor and Owner any errors, inconsistencies and omissions discovered by the Architect in the Shop Drawings, Product Data and Samples.

§ 4.2.8 ~~The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.~~ The Architect shall review, prepare and make recommendations to Owner regarding all Change Orders and Construction Change Directives for the Owner's approval and execution in accordance with the Construction Documents and the Contract Documents, accompanied by all supporting documentation. The Architect may authorize minor changes in the Work not involving an adjustment in Contract Sum or Guaranteed Maximum Price, or an extension of the Contract Time which are consistent with the intent of the Contract Documents. If necessary, the Architect shall prepare, reproduce and distribute Drawings and Specifications to describe Work to be added, deleted or modified, as provided in Section 7.4. The Architect shall accept requests by the Owner, and shall review properly prepared, timely requests by the Contractor for changes in the Work, including adjustments to the Contract Sum or Guaranteed Maximum Price, or Contract Time. A properly prepared request for a change in the Work by the Contractor shall be accompanied by sufficient supporting data and information to permit the Architect to make a reasonable determination without extensive investigation or preparation of additional drawings or specifications. If the Architect determines that requested changes in the Work are not materially different from the requirements of the Construction Documents or the Contract Documents, and do not change the Contract Sum or Guaranteed Maximum Price, or Contract Time, then the Architect may issue an order for a minor change in the Work with prior written notice to the Owner or recommend to the Owner that the requested change be denied. The Architect is not authorized to approve changes involving major systems such as: Heating, Ventilation and Air Conditioning ("HVAC"); roof; foundation; outward appearance; color schemes; floor plans; building materials; drainage or mechanical equipment without Owner's prior written consent.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and ~~decide matters~~ make recommendations concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations ~~and decisions~~ or recommendations of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and ~~decisions~~recommendations, the Architect will endeavor to secure faithful performance by both Owner and Contractor~~, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith~~.

§ 4.2.13 The ~~Architect~~Owner's decisions on matters relating to aesthetic effect ~~will~~ shall be final. ~~if consistent with the intent expressed in the Contract Documents.~~

§ 4.2.14 The Architect will review and respond to requests for information about the Construction Documents and the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information, at no additional cost to the Owner.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in

number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect in writing of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect ~~may~~ shall notify in writing the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection. All subcontractors shall be procured in accordance with Texas Education Code Chapter 44, Subchapter B, and Texas Government Code Chapter 2269, as applicable. A notice of no reasonable objection shall in no way relieve the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents. The Contractor shall be fully responsible for the performance of its subcontractors, including those recommended or approved by the Owner.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. ~~If the proposed but rejected~~ When the parties agree on a proposed substitute Subcontractor ~~was reasonably capable of performing the Work~~, then the Contract Sum and Contract Time ~~shall~~ may be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.2.5 Each Contractor or subcontractor shall be required to completely familiarize itself with the plans and specifications, to visit the Work site to completely familiarize itself with existing conditions, and to conduct any other appropriate investigations, inspections or inquiries prior to submission of a bid or proposal. No increases in Contract Sums or Guaranteed Maximum Price shall be allowed for failure to so inspect or investigate.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. The terms and conditions of the Contract Documents shall be incorporated by reference into each subcontract agreement, included as provided below. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may

be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Each subcontractor shall provide proof of insurance to Contractor consistent with the Contractor's insurance to Owner and in an amount commensurate with the Work to be performed by the Subcontractor.

§ 5.3.2 Neither the Owner nor the Architect shall be obligated to pay or to insure the payment of any monies to subcontractors due to any non-payment to the Contractor or non-payment of subcontractors by the Contractor.

§ 5.3.3 The Contractor shall require any potential subcontractor to disclose to the Contractor any ownership interest or familial relationship between the Contractor, the Architect or the Owner and the potential subcontractor prior to entering into a subcontract. Contractor shall report to Owner all such disclosures and the Owner shall have the right, in its sole discretion, to reject any such affiliated subcontractor.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for any unperformed ~~a~~ portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause or convenience pursuant to ~~Section~~Article 14~~.2~~ or abandonment of the Project by the Contractor; and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- **.2** assignment is subject to the prior rights and obligations of the surety, if any, obligated under bond relating to the Contract~~.~~ ; and
- **.3 The Subcontractor provides bonds as required by law of prime contractors and by Owner.**

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 ~~Upon s~~Such assignment~~, if the Work has been suspended for more than 30 days, the Subcontractor's compensation~~ shall ~~be equitably adjusted for increases in cost resulting from the suspension.~~ not constitute a waiver by Owner of its rights against Contractor, including, but not limited to, claims for defaults, delays or defects for which a subcontractor or material vendor may also be liable.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. ~~If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.~~ Owner shall only be responsible for compensating subcontractors for Work performed or materials furnished from and after the date on which the Owner gives written notice of its acceptance of the subcontract agreement. Owner shall not be responsible for any Work performed or materials furnished by subcontractors prior to the date of Owner's written notice of acceptance.

§ 5.5 NOTICE OF SUBCONTRACTOR DEFAULT

Contractor shall promptly notify Owner and Architect of any material defaults by any Subcontractor or Sub-subcontractor. Notwithstanding any provision contained in Article 5 to the contrary, it is hereby acknowledged and agreed that Owner has in no way agreed, expressly or implicitly, nor will Owner agree, to allow any Subcontractor, Sub-subcontractor or other materialman or worker employed by Contractor the right to obtain a personal judgment or to create a mechanic's or materialman's lien against Owner for the amount due from the Owner or the Contractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. The Owner reserves the right to perform other non-Project-related construction work, maintenance and repair work, and school program operations at the site and near the site during the time period of the Work.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The ~~Owner~~ Contractor shall ~~provide for coordination of~~coordinate the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor to ensure that the Work remains on schedule~~, who shall cooperate with them~~. ~~The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules.~~ The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement between the Owner and Contractor. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 ~~Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.~~

§ 6.2 CONTRACTOR'S~~Mutual~~ Responsibility

§ 6.2.1 It shall be the responsibility of the Contractor to assist, review, and coordinate the scheduling of work performed by any of the Owner's Separate Contractors. In addition, the Contractor shall be responsible for coordinating and providing all construction administration necessary for the Work and the work of any of Owner's Separate Contractors. The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for site access and introduction and storage or staging of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents. Contractor shall be responsible for coordination between Contractor's subcontractors and Owner's Separate Contractors. Contractor shall review Owner's contract with Owner's Separate Contractors and become familiar with the requirements and scope of services contained therein.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify in writing the Architect and Owner of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work, and shall promptly report in writing to the Architect and Owner if Owner's Separate Contractors fail in any way to timely perform their services or negatively impact Contractor's schedule or ability to perform the Work . Failure of the Contractor to notify in writing the Architect and Owner of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper, and is performed in a timely manner, to receive the Contractor's Work. The Contractor shall not be responsible for latent discrepancies or defects in the construction or operations by the Owner or Separate Contractor ~~that are not apparent~~.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. ~~The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.~~

§ 6.2.3.1 If the Architect is required to provide additional services as provided in the Agreement between the Owner and the Architect, specifically relating to additional compensation for the Architect for evaluating an excessive number of claims submitted by the Contractor or others in connection with the Work in accordance with the Owner's Agreement with the Architect, then such services shall be paid for by the Contractor through the Owner, unless the additional services result from negligence of or an omission by the Architect.

§ 6.2.3.2 If the Architect provides services in connection with a legal proceeding, except when the Architect is a party thereto, and the Owner requests the Architect in writing to provide such services, then the cost of such services shall be paid for by the party whose act or omission was a proximate cause of the problem that led to the requirement to provide such services. Such services shall be paid for by such party through the Owner, who upon receipt of same shall reimburse the Architect.

§ 6.2.3.3 All construction costs resulting from the Contractor's negligence, lack of oversight, inattention to detail, failure to investigate, or failure to follow the Construction Documents or Contract Documents, will be borne by the Contractor.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the ~~Architect~~ Owner will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. A properly prepared written request for a change in the Work by Contractor shall be accompanied by sufficient supporting data and information to permit the Architect to make a recommendation to Owner.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents or Construction Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work. Contractor shall not make any claim for an adjustment to time, Contract Sum or Guaranteed Maximum Price due to: a change in the materials used; a change in the specified manner of constructing and/or installing the Work; or additional labor, services, or materials, beyond that actually required by the terms of the Construction Documents or the Contract Documents, unless made pursuant to a written order or directive from Owner authorizing Contractor to proceed with a change in the Work. No claim for an adjustment to time, Contract Sum or Guaranteed Maximum Price shall be valid unless so ordered or directed.

§ 7.1.4 The total Contractor mark-up for overhead, profit, or fee for work performed by the Contractor's own forces shall not exceed 10% of the cost of the change in the Work. The total Contractor mark-up for overhead, profit or fee for supervision of work performed by subcontractors' forces shall not exceed 4% of the cost of the change in the Work. The total subcontractor mark-up for overhead, profit or fee for work performed by the subcontractor's forces shall not exceed 10% of the cost of the change in the Work. In no event shall total mark-up for overhead, profit or fee in any work which involves a subcontractor or one or more sub-subcontractors, regardless of who performs the work, exceed 14% of the total cost of the change in the Work.

§ 7.1.5 Allowance balances may be used to fund changes in the Work. The Contractor will not be allowed an overhead, profit, or fee mark-up when changes in the Work are funded by one of the Allowances.

§ 7.1.6 If the Contract Sum is $1,000,000.00 or more, or if the Contract Sum is less than $1,000,000.00, and any Change Order, Construction Change Directives, or other Changes in the Work would increase the Contract Sum to $1,000,000.00 or more, the total of all Change Orders, Construction Change Directives, or other Changes in the Work may not increase the Contract Sum by more than 25% of the original Contract Sum. Any Change Order, Construction Change Directive, or other Change in the Work that would exceed that limit is void and of no effect. Texas Education Code §44.0411.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum or Guaranteed Maximum Price; and

.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum or Guaranteed Maximum Price may include those listed in Section 7.3.3.

§ 7.2.3 Contractor stipulates that acceptance of a Change Order by the Contractor constitutes full accord and satisfaction for any and all Claims, whether direct or indirect, arising from the subject matter of the Change Order.

§ 7.2.4 In no event shall a single change, or the aggregate of all changes, result in the total costs, reimbursements and fees exceeding the Contract Sum or the Guaranteed Maximum Price, unless agreed to in writing by Owner prior to the commencement of such modified or changed Work.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Guaranteed Maximum Price, or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum or Guaranteed Maximum Price and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum or Guaranteed Maximum Price, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon (additional mark-ups for overhead, profit, and fees will not be allowed);

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee, subject to the limitations of subparagraph 7.1.4; or

.4 As provided in Section 7.3.4, subject to the limitations of subparagraph 7.1.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum or Guaranteed Maximum Price, then Architect shall determine the adjustment on the basis of the amount by which the Contractor's direct costs have actually been increased over the direct cost of performing the Work without the Change in the Work. Direct costs shall be limited to the following:~~reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:~~

.1 Actual ~~C~~costs of labor, including applicable payroll taxes, ~~fringe benefits required by agreement or custom~~, and workers' compensation insurance~~, and other employee costs approved by the Architect~~;

.2 Actual ~~C~~costs of materials, supplies, and equipment, including cost of transportation, used in performing the Change in the Work~~whether incorporated or consumed~~;

.3 Actual ~~R~~rental costs of machinery and equipment rented from third parties, exclusive of hand tools~~, whether rented from the Contractor or others~~;

.4 Actual ~~C~~costs of premiums for all bonds and insurance, and permit fees~~, and sales, use, or similar taxes,~~ directly related to the change; and

~~.5 Costs of supervision and field office personnel directly attributable to the change.~~
The Contractor shall keep and present, in such form as the Architect or Owner may prescribe, an itemized accounting of the items listed above, together with appropriate supporting documentation.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Guaranteed Maximum Price, or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum or Guaranteed Maximum Price, and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost plus the Contractor's allocated percent of profit and overhead, all as confirmed by the Architect. ~~When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.~~

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

With prior written notice to the Owner's representative, ~~T~~the Architect may order minor changes in the Work that are consistent with the ~~intent of the~~ Contract Documents or Construction Documents and do not involve an adjustment in the Contract Sum or Guaranteed Maximum Price, or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Guaranteed Maximum Price, or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Guaranteed Maximum Price, or Contract Time, the Contractor waives any adjustment to the Contract Sum or Guaranteed Maximum Price, or extension of the Contract Time. The Contractor shall carry out such written orders promptly. Minor changes in the Work shall not include changes that involve the outward appearance of the structure, color schemes, floor plans, building materials, landscaping, or mechanical equipment.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for ~~Substantial~~ Final Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the ~~date established in the Agreement~~first business day after Contractor's receipt of the written Notice to Proceed. The Notice to Proceed shall not be issued by Architect until the Agreement (or Amendment, if Contractor is a Construction Manager at Risk) has been signed by the Contractor, approved by Owner's Board of Trustees, signed by the Owner's authorized representative, and Owner and Architect have received, and approved as to form, all required payment and performance bonds and insurance, in compliance

with Article 11. Issuance of the Notice to Proceed shall not relieve the Contractor of its responsibility to comply with Article 11.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8. The date of Final Completion is the date certified by the Architect in accordance with Paragraph 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than 30 days after the date of Substantial Completion.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor stipulates~~confirms~~ that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial and Final Completion within the Contract Time.

§ 8.2.4 The Contractor is subject to liquidated damages, as specified in the Agreement, if the Work is not completed by the date of Substantial Completion or the date of Final Completion.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by ~~labor disputes,~~ fire, governmental actions, ~~unusual delay in deliveries, unavoidable casualties,~~ or adverse weather conditions documented in accordance with Section 15.1.6.2, ~~or other causes beyond the Contractor's control~~; (4) by delay authorized in writing by the Owner ~~pending mediation and binding dispute resolution~~; or (5) by other causes that the Contractor asserts, and the Architect and Owner determines~~,~~ may justify delay, then the Contract Time ~~shall~~ may be extended for such reasonable time as the Architect and Owner may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 ~~This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.~~ This Agreement does not permit the recovery of damages, including, without limitation, extended home office overhead expenses, general conditions, or other consequential damages, by the Contractor for delay or disruption or for extensions of time due to bad weather or acts of God. Contractor agrees that the only possible compensation for any delay is an extension of time.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. In the event that the Project is a Construction Management at Risk Project, the Contract Sum shall not exceed the Guaranteed Maximum Price.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices may ~~shall~~ be equitably adjusted by prior written agreement.

§ 9.2 Schedule of Values

§ 9.2.1 Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum or, in the case of a Guaranteed Maximum Price, within 15 days after establishing the Guaranteed Maximum Price, to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The schedule of values shall be prepared in such a manner that each major item of work, whether done by Contractor's own forces or subcontracted, is shown as a single line item on AIA Documents G702 and G703, Application and Certificate for Payment and Continuation Sheet. If the Contractor is a Construction Manager at Risk, then the Contractor's fee and general conditions shall be specifically shown, and AIA Documents G702CMa and G703 shall be used.

§ 9.2.2 If the project is a Construction Manager at Risk project, in order to facilitate the review of Applications for Payment, the Schedule of Values shall be submitted on AIA Documents G702 and G703, and shall include the following:

.1 Contractor's cost for Contractor's fee (if applicable) bonds and insurance, mobilization, or general conditions, etc. shall be listed as individual line items.

.2 Contractor's costs for various construction items shall be detailed. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, or paving, etc.

.3 On major subcontracts, such as mechanical, electrical and plumbing, the schedule shall indicate line items and amounts in detail (for example: underground, major equipment, fixtures, installation fixtures, or start-up, etc.).

.4 Costs for subcontract work shall be listed without any additional mark-up of Contractor's costs for overhead, profit, or supervision.

.5 If payment for stored materials is requested prior to installation, then material and labor shall be listed as separate line items.

.6 Contractor shall provide a report of actual versus projected reimbursable expenses (general conditions), updated monthly.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect requires, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage ~~if provided for in the Contract Documents~~.

§ 9.3.1.1 ~~As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.~~ Contractor agrees that, for purposes of Texas Government Code Sections 2251.021 and 2251.042, receipt of the Application for Payment by the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Owner's receipt of the Certificate for Payment shall be construed as receipt of an invoice by the Owner, for purposes of Texas Government Code Sections 2251.021 and 2251.042.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor ~~does not intend to pay~~has not been invoiced by a Subcontractor or supplier, unless ~~such Work has been performed by others whom the Contractor intends to pay~~ Contractor has self-performed the Work.

§ 9.3.1.3 Until Final Completion of the Work, the Owner shall withhold retainage as provided in the Contract Documents, except that Owner shall not pay amounts for which the Architect refuses to certify payment, or the Owner refuses to pay, as provided herein in Section 9.4.3 or 9.5, as amended. The retainage shall be paid with the Final Payment. *(Note: if more than 5% is retained, under Texas law, then the retainage must be placed in an interest-bearing account, and the contractor must be paid the interest earned on the retainage upon completion of the Work. Texas Government Code Section 2252.032).*

§ 9.3.2 ~~Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.~~Payments will be made on the basis of invoices for specific materials or equipment incorporated in the Work and specific materials or equipment (1) suitably stored at the site or (2) suitably stored at some off-site location, provided the following conditions are met for off-site storage:

.1 The location must be agreed to, in writing, by the Owner and Surety.

.2 The location must be a bonded warehouse.

.3 The Contractor's Surety must agree, in writing, to the amounts included in each Application for Payment.

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the off-site storage area and reviewing the stored contents. Contractor acknowledges that Architect's time may be an Additional Service and shall compensate Architect directly for same upon request.

.5 Payment shall not include any charges for overhead or profit on stored materials.

.6 Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other documentation satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance (naming the Owner as insured and naming the specific materials or equipment stored and their location) and proof of delivery to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment until the materials or equipment are delivered to Owner's site or the agreed-upon off-site storage. Failure to follow these procedures shall result in nonpayment for storage of or insurance on stored materials and equipment. Failure to follow these procedures shall also result in nonpayment of materials and equipment until said materials and equipment are incorporated into the Work.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. CONTRACTOR SHALL WAIVE, RELEASE, INDEMNIFY, AND HOLD OWNER HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY THE CONTRACTOR, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH, OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.

§ 9.3.4 Contractor shall submit Applications for Payment in quadruplicate using AIA Documents G702 and G703 Application and Certificate of Payment (or G702CMa, if applicable) and Continuation Sheet. All blanks in the form must be completed and signatures of Contactor and Notary Public must be original on each form. Incomplete or inaccurate Applications for Payment shall be returned to the Contractor by the Architect for completion and/or correction. Owner shall have no responsibility for payment of same if the Application for Payment is incomplete or inaccurate.

§ 9.3.5 By signing each Application for Payment, the Contractor stipulates and certifies to the following: that the information presented is true, correct, accurate and complete; that the Contractor has made the necessary detailed examinations, audits, and arithmetic verifications; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials and supplies identified in the Applications for Payment have been purchased, paid for, and received; that the subcontractors have been paid as identified in the Applications for Payment or that Contractor has been invoiced for same; that Contractor has made the necessary on-site inspections to confirm the accuracy of the Applications for Payment; that there are no known mechanics' or materialmens' liens outstanding at the date of the Application for Payment; that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current Payment Application; that, except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmens' liens on the Work; that the Payment Application includes only Work self-performed by Contractor or for which Contractor has been invoiced; and that releases from all Subcontractors and materialmen have been obtained in such form as to constitute an effective release of lien under the laws of the State of Texas covering all Work performed and for which payment has been made by the Owner to the Contractor. Contractor understands that documents submitted to Owner become government documents under the laws of the State of Texas. Contractor further understands that falsification of Contractor's Application for Payment may constitute a violation of the penal laws of the State of Texas, including, but not limited to, Texas Penal Code Sections 32.46, 37.09, and 37.10, and may justify termination of Contractor's Contract with Owner. Contractor further understands and agrees that falsification of documents may entitle Owner to restitution as permitted by Texas law and these Contract Documents.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, carefully evaluate and review the Application for Payment and, when appropriate, return the Application for Payment to the Contractor as provided in Section 9.3.4. If the Application for Payment is complete, then the Architect shall sign and either: (1) certify and issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) certify and issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner in writing of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. Architect's written reasons for withholding certification shall be construed as the notice required by Texas Government Code Section 2251.042 et seq.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner~~,~~ ~~based on the Architect's evaluation of the Work and the data in the Application for Payment,~~ that the Architect has observed the progress of the Work and determined that, in the Architect's professional opinion~~,~~ ~~to the best of the Architect's knowledge, information, and belief,~~ the Work has progressed to the point indicated~~,~~ and the quality of the Work is in accordance with the Contract Documents. Further, the issuance of the Certificate for Payment will constitute a representation by the Architect to the Owner that the Architect has~~,~~ carefully evaluated and certified that the amounts requested in the Application for Payment are valid and correct and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect in writing to the Owner. However, the issuance of a Certificate for Payment will not be a representation that the Architect has: (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data unless requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how

or for what purpose the Contractor has used money previously paid on account of the Contract Sum. Examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's accountants or other representatives of the Owner acting in the sole interest of the Owner.

§ 9.4.3 The issuance of a Certificate for Payment shall constitute a recommendation to the Owner regarding the amount to be paid. This recommendation is not binding on the Owner if Owner knows of other reasons under the Contract Documents why payment should be withheld.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; ~~or~~
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents; or
- .8 failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract time.

§ 9.5.2 When ~~either party~~the Contractor disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, ~~that party~~the Contractor may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 ~~If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment~~Notwithstanding any provision contained within this Article, if the Work has not attained Substantial Completion or Final Completion by the required dates, subject to extensions of time allowed under the Contract Documents, then Architect may withhold any further Certificate for Payment from Contractor to the extent necessary to preserve sufficient funds to complete the construction of the Project and to cover liquidated damages. The Owner shall not be deemed in default by reason of withholding payment as provided for in Sections 9.3.4, 9.4.3, 9.5.1, or this Section.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment for undisputed amounts in the manner and within the time provided in the Contract Documents~~,~~ and shall so notify the Architect. Owner shall notify Contractor within 21 days if Owner disputes the Architect's Certificate for Payment pursuant to Texas Government Code Section 2251.042 et seq., listing the specific reasons for nonpayment. Payments to the Contractor shall not be construed as releasing the Contractor or his Surety from any obligations under the Contract Documents.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. In compliance with Texas Government Code Section 2251.022, the Contractor shall, within ten (10) days following receipt of payment from the Owner, pay all bills for labor and materials performed and furnished by others in connection with the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor shall include a provision in each of its subcontracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder, and if the Owner so requests, shall provide to the Owner copies of such Subcontractor payments. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, then the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner. This Section is subject to the provisions of Texas Business and Commerce Code Chapter 56.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier., ~~, except as may otherwise be required by law.~~ Any action taken by the Owner to require the Contractor to pay a Subcontractor shall not impose any liability on Owner to the Subcontractor or supplier.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision. Payments received by the Contractor from the Owner for Work properly performed by Subcontractors, or materials properly provided by suppliers, shall be held in trust by the Contractor for the benefit of those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor. Texas Property Code §162.001.

§ 9.6.8 ~~Provided the Owner has fulfilled its payment obligations under the Contract Documents, t~~ THE CONTRACTOR SHALL DEFEND AND INDEMNIFY THE OWNER FROM ALL LOSS, LIABILITY, DAMAGE OR EXPENSE, INCLUDING REASONABLE ATTORNEY'S FEES AND LITIGATION EXPENSES, ARISING OUT OF ANY LIEN CLAIM OR OTHER CLAIM FOR PAYMENT BY ANY SUBCONTRACTOR OR SUPPLIER OF ANY TIER. UPON RECEIPT OF NOTICE OF A LIEN CLAIM OR OTHER CLAIM FOR PAYMENT, THE OWNER SHALL NOTIFY THE CONTRACTOR. IF APPROVED BY THE APPLICABLE COURT, WHEN REQUIRED, THE CONTRACTOR MAY SUBSTITUTE A SURETY BOND FOR THE PROPERTY AGAINST WHICH THE LIEN OR OTHER CLAIM FOR PAYMENT HAS BEEN ASSERTED.

§ 9.6.9 Contractor shall not withhold as a retainage a greater percentage from Subcontractors or materialmen than the percentage that Owner withheld as retainage from payments to Contractor.

§ 9.7 Failure of Payment

§ 9.7.1 ~~If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or~~ Pursuant to Texas Government Code Section 2251.051, if the Owner does not pay the Contractor any payment certified by the Architect, which is undisputed, due, and owing ~~within seven days~~ after the date the payment is due under the Contract Documents,~~established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution,~~ then the Contractor ~~may~~, upon ten (10) ~~seven~~ additional days' written notice to the Owner and Architect, that payment has not been made and the Contractor intends to suspend performance for nonpayment, may stop the Work until payment of the undisputed amount owing has been received. ~~The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.~~ If the Owner provides written notice to the Contractor that: 1) payment has been made; or 2) a bona fide dispute for payment exists, listing the specific reasons for nonpayment, then Contractor shall be liable for damages resulting from suspension of the Work. If a reason specified is that labor, services, or materials provided by the Contractor are not provided in compliance with the Contract Documents, then the Contractor shall be provided a reasonable opportunity to cure the noncompliance or to compensate Owner for any failure to cure the noncompliance. No amount shall be added to the Contract Sum as a result of a dispute between Owner and Contractor unless and until such dispute is resolved in Contractor's favor.

§ 9.7.2 If the Architect does not issue a Certificate for Payment within seven days after receipt of the Contractor's Application for Payment, through no fault of the Contractor, then the Contractor shall provide written notice to the Owner, and the Owner shall have fourteen (14) business days after receipt of such notice to provide or obtain a Certificate for Payment. If Owner fails to provide or obtain the Certificate for Payment, then the Contractor may, upon fourteen (14) additional business days' written notice to the Owner and Architect, stop the Work until payment of the undisputed amount owing has been received.

§ 9.7.3 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, then such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due to Owner, pursuant to the Contract, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, then the Owner shall have an absolute right to offset such amount against the Contract Sum and, in the Owner's sole discretion and without waiving any other remedies, may elect either to:

.1 deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due to Contractor from the Owner, or

.2 issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; all Project systems included in the Work or designated portion thereof have been successfully tested and are fully operational; all required governmental inspections and certifications required of the Work have been made, approved and posted; designated initial instruction of Owner's personnel in the operation of Project systems has been completed; and all the required finishes set out in the Construction Documents are in place. The only remaining Work shall be minor in nature so that the Owner can occupy the Work or the applicable portion of the Work for all of its intended purposes on that date; and the completion of the Work by the Contractor will not materially interfere with or hamper Owner's normal school operations or other intended use. As a further condition of a determination of Substantial Completion, the Contractor shall certify that all remaining Work shall be completed within 30 days. Contractor shall complete Owner's Substantial Completion Certificate.

.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of

items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, then the Architect shall so notify the Contractor and Owner in writing, and the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. Except with the consent of the Owner, the Architect shall perform no more than five inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare~~.~~, sign and issue Owner's ~~a~~ Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of ~~Substantial~~ Final Completion of the Work or designated portion ~~thereof unless otherwise provided in the Certificate of Substantial Completion~~.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. ~~Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.~~

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when ~~such portion is designated by separate agreement with~~ agreed to by the Owner and the Contractor in writing, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided that the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work resulting from such occupancy, use or installation, and property and liability insurance, ~~and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents~~. ~~When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2.~~ Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect. Contractor agrees that the Owner may place and install as much equipment and furnishings as is possible before completion or partial completion of portions of the Work.

§ 9.9.2 Immediately prior to such partial occupancy, ~~or~~ use, or installation, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon in writing, partial occupancy or use of a portion or portions of the Work or installation of furnishings and equipment shall not constitute acceptance of Work not complying with the requirements of the Contract Documents~~.~~, nor shall it constitute evidence of Substantial Completion or Final Completion.

§ 9.9.4 In the event that Owner takes partial occupancy or installs furnishings and equipment prior to Substantial Completion of the Project, Contractor shall obtain an endorsement to Contractor's Builder's Risk Policy to provide

extended coverage for partial occupancy if Contractor's Builder's Risk Coverage required by Article 11 would not otherwise provide such coverage.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly prepare, sign, and issue Owner's Certificate of Final Completion and a final Certificate for Payment ~~stating that to the best of the Architect's knowledge, information and belief~~ certifying to the Owner that, ~~and~~ on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance, including all retainages, found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. Final payments shall be made by the Owner in accordance with Owner's regular schedule for payments.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) using AIA Document G706, an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) ~~a certificate evidencing~~ evidence satisfactory to Owner that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) using AIA Document G707, consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) ~~if required by the Owner~~except for amounts previously withheld by the Owner, other data establishing payment or satisfaction of obligations, such as AIA Document G706A, notarized subcontractor's lien releases, receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. In addition, the following items must be completed and received by the Owner before Final Payment will be due:

.1 Written certifications required by Sections 10.5, 10.6, and 10.7;

.2 Final list of subcontractors (AIA Document G705);

.3 Contractor's certification in Texas Education Agency's Certification of Project Compliance, located at www.tea.state.tx.us/school.finance/facilities/cert_2004.pdf;

.4 Contractor's warranties, organized as required elsewhere in the Contract Documents;

.5 Maintenance and Instruction Manuals;

.6 Owner's Final Completion Certificate; and

.7 "As-constructed record drawings". At the completion of the Project, the Contractor shall submit one complete set of "as-constructed" record drawings, with all changes made during construction, including concealed mechanical, electrical, and plumbing items. The Contractor shall submit these as electronic, sepia, or other acceptable medium, in the discretion of the Owner. The "as-constructed" record drawings shall delete the seal of the Architect and/or the Engineer and any reference to those firms providing professional services to the Owner, except for historical or reference purposes.

Documents identified as affidavits must be notarized. All manuals will contain an index listing the information submitted. The index section will be divided and identified by tabbing each section as listed in the index. Upon

request, the Architect will furnish the Contractor with blank copies of the forms listed above. Final payment shall be paid by the Owner to the Contractor within thirty (30) days after Owner's Board of Trustees has voted to accept the Work and approve Final Payment.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, ~~except that~~and it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall not constitute a waiver of any Claims by the Owner~~, except those arising from~~

~~.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;~~

~~.2 failure of the Work to comply with the requirements of the Contract Documents;~~

~~.3 terms of special warranties required by the Contract Documents; or~~

~~.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.~~

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously asserted pursuant to Article 15 ~~made in writing~~ and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc., latest edition, and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration ("OSHA") 29 USC Section 651 et seq., and all amendments thereto. However, the Contractor's duties herein shall not relieve any Subcontractor or any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, from the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.1.2 Contractor's employees, agents, Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not perform any service for Owner while under the influence of any amount of alcohol or any illegal controlled substance; or use, possess, distribute, or sell alcoholic beverages while on Owner's premises. No person shall: use, possess, distribute, or sell illegal or nonprescribed controlled drugs or drug paraphernalia; misuse legitimate prescription or over-the-counter drugs; or act in contravention of warnings on medications while performing the Work or while on Owner's premises. Contractor's employees, agents, Subcontractors, or anyone directly or indirectly employed by any of them, shall not distribute or sell alcohol or drugs of any kind to Owner's students or staff, regardless of the location of the distribution or sale.

§ 10.1.3 Contractor will comply with all applicable federal, state, and local drug and alcohol-related laws and regulations (e.g., Department of Transportation regulations, Drug-Free Workplace Act). Contractor has adopted or will adopt its own policy to assure a drug-free and alcohol-free workplace while on Owner's premises or performing the Work. Contractor will remove any of its employees, agents, subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such person, and at any time an incident occurs where drug or alcohol use could have been a contributing factor. Owner has the right to require Contractor to remove any person from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, the person so removed may only be considered for return to work after the Contractor certifies, as a result of a for-cause test, conducted immediately following removal, that said person was in compliance with this

Contract. Contractor will not use any person to perform the Work who fails or refuses to take, or tests positive on, any for-cause alcohol or drug test.

§ 10.1.4 Owner has also banned the presence of all weapons on the Project site, whether or not the owner thereof has a permit for a weapon, and Contractor agrees that Contractor's representatives, employees, agents, and subcontractors will abide by same. Weapons may only be permitted in Owner's parking lots if weapons are locked in personal vehicles in Owner's parking lot.

.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work, school personnel, students, and other persons on Owner's premises, and other persons who may be affected thereby, including the installation of fencing between the Work site and any connecting or adjacent property of Owner, when required by Texas Education Code Section 22.08341;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as other buildings, and their contents, fencing, trees, shrubs, lawns, walks, athletic fields, facilities and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any personal or real property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor.

§ 10.2.4 When use or storage of ~~explosives or other~~ hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment, or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosive materials on Owner's property is prohibited unless expressly approved in advance in writing by Owner and Architect.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. ~~The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.~~ The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 The Contractor shall do all things reasonably necessary to protect the Owner's premises and all persons from damage and injury when all or a portion of the Work is suspended for any reason.

§ 10.2.9 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work which cause death, bodily injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious bodily injuries, or serious property damages are caused, then the accident shall be reported immediately by any means necessary to give actual notice to the Owner's representative and the Architect.

§ 10.2.10 Contractor's obligations under Section 10.2 as to each portion of the Project shall continue until Owner takes possession of and occupies that portion of the Project.

§ 10.2.11~~8~~ Injury or Damage to Person or Property

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The written notice shall provide sufficient detail to enable the other party to investigate the matter. Contractor understands and acknowledges that, under Texas law, Owner has sovereign and/or governmental immunity as to all torts except as to the Owner's permitted use or operation of Owner's motor vehicles, subject to any defenses under law.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify in writing the Owner and Architect of the condition. In the event the Contractor encounters polychlorinated biphenyl (PCB), and the specifications require the PCB's removal, the Contractor shall remove the PCB and store it in marked containers at the jobsite provided by the Owner. If PCBs are found which are leaking, then Contractor shall stop work on the affected fixture and shall contact Owner for removal and disposal of the leaking PCBs.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. ~~By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.~~ The Contractor may be entitled to an equitable adjustment regarding the Date of Substantial Completion and/or Final Completion.

§ 10.3.3 ~~To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.~~ IF CONTRACTOR IMPORTS HAZARDOUS MATERIALS ONTO THE

PROJECT SITE, THEN CONTRACTOR HEREBY INDEMNIFIES AND HOLDS HARMLESS THE OWNER, ITS CONSULTANTS, TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES, AGAINST ANY CLAIMS ARISING OUT OF OR RELATED TO SUCH IMPORTATION, INCLUDING BUT NOT LIMITED TO COSTS AND EXPENSES THE OWNER INCURS FOR REMEDIATION OF A MATERIAL OR SUBSTANCE THE CONTRACTOR BRINGS TO THE SITE, AS PROVIDED FOR IN SUBPARAGRAPH 3.18.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site ~~unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.~~

§ 10.3.5 ~~The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.~~

§ 10.3.6 ~~If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.~~

§ 10.4 Emergencies

§ 10.4.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. ~~Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.~~

§ 10.4.2 The performance of the foregoing services by the Contractor shall not relieve the subcontractors of their responsibility for the safety of persons and property and for compliance with all federal, state and local statutes, rules, regulations and orders of any governmental authority applicable to the conduct of the Work.

§ 10.5 ASBESTOS OR ASBESTOS-CONTAINING MATERIALS

§ 10.5.1 Contractor shall submit to the Architect a written certification addressed to the Owner that all materials used in the construction of this Project contain less than 0.10% by weight of asbestos and for which it can be demonstrated that, under reasonably foreseeable job site conditions, will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter. The written certification shall further state that, should asbestos fibers be found at this Project in concentrations greater than 0.1 fibers per cubic centimeter, then Contractor shall be responsible for determining which materials contain asbestos fibers and shall take all necessary corrective action to remove those materials from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.5.2 Final Payment shall not be made until this written certification has been received.

§ 10.6 LEAD-FREE MATERIAL IN POTABLE WATER SYSTEM

§ 10.6.1 Prior to payment of retainage and final payment, the Contractor and each subcontractor involved with the potable water system shall furnish a written certification that the potable water system is "lead-free".

§ 10.6.2 The written certification shall further state that should lead be found in the potable water system built under this Project, then Contractor shall be responsible for determining which materials contain lead and shall take all necessary corrective action to remove lead from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.7 HAZARDOUS MATERIALS CERTIFICATION

The Contractor shall provide written certification that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by federal, state or local standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards; and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Project Manual related to Contract Closeout.

ARTICLE 11 INSURANCE AND BONDS

§ 11.0.1 No Work will be commenced, and no equipment or materials can be shipped, until all requirements of this Article have been satisfied, satisfactory evidence of insurance has been provided, and all insurance is in full force and effect. Contractor shall notify Owner and Architect in writing of any proposed nonconformity with these requirements, and shall notify Owner and Architect in writing of any insurance changes which occur during the terms required under the Contract Documents. Any deviation from these requirements can only be approved by Owner's Board of Trustees. Any nonconformity may be grounds for termination or modification of the Contract. To the extent that Contractor is unable to procure the insurance designated herein because the insurance is not reasonably available or is cost-prohibitive, then Contractor shall provide written notice to Owner's Board of Trustees. Said lack of insurance may then be grounds for termination or modification of this Agreement.

§ 11.0.2 Satisfactory evidence of insurance required by this Article shall be provided to Owner and Architect not later than five business days after execution of the Contract by Owner. Satisfactory evidence shall include copies of all required insurance policies, declarations, and endorsements themselves. In addition, Contractor shall also provide a duly-executed ACORD Form 25 Certificate of Liability Insurance naming Owner as a certificate holder and additional insured (except as noted in Section 11.0.4) and attaching all endorsements required herein. The Contractor shall furnish Owner all insurance amendments, renewals, notices, cancellations, and additional endorsements, as they are provided to Contractor.

§ 11.0.3 All insurance required herein shall be obtained from a company licensed to do business in the State of Texas by the Texas Department of Insurance, and shall be underwritten by a company rated not less than A-X in A.M. Best's Key Rating Guide, Property-Casualty, according to the latest posted ratings available on A.M. Best's website, www.ambest.com, and that permits waivers of subrogation.

§ 11.0.4 All insurance required herein shall name the Owner, its officers, employees, representatives, or agents, as an additional insured, except Contractor's Worker's Compensation insurance.

§ 11.0.5 All insurance required herein shall, by endorsement, be primary and non-contributory insurance with respect to the Owner, its officers, employees, representatives, or agents. All insurance shall be written on an occurrence basis, if available, and shall contain a waiver of subrogation in favor of Owner as provided for in Section 11.3.

§ 11.0.6 Any failure of Contractor to comply with the reporting provisions of the policies shall not affect the coverage provided to the Owner, its officers, employees, representatives, or agents.

§ 11.0.7 All workers on the Project must be covered by the required insurance policies of the Contractor or a Subcontractor.

§ 11.0.8 Nothing contained in this Article shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor and the Contractor's Subcontractors shall purchase and maintain such insurance as will protect them and the Owner from claims ~~which~~ that may arise out of, or result from, the Contractor's operations under the Contract, whether such operations be by Contractor or by any Subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, at a minimum, of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in this Section 11.1, in the Agreement, or elsewhere in the Contract Documents. ~~The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be~~

~~named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents~~. Such insurance shall include the following:

.1 Claims under workers' compensation, disability benefit, and other similar employee benefit acts that are applicable to the Work to be performed, including private entities performing work at the site, and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project (see ~~Section 11.1.2.1~~Exhibit A);

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person, or property damage arising out of ownership, maintenance, or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations;

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under the Contract Documents, including under Section 3.18; and

.9 Claims for damages to the Work itself, through builder's risk insurance, pursuant to A101-2017, Exhibit A.

§ 11.1.2 ~~The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.~~

§ 11.1.2.1 The Contractor shall furnish separate payment and performance bonds covering faithful performance of the Contract and payment of obligations arising thereunder, ~~-~~each bond to be in a total amount equal to 100% of the Contract Sum or Guaranteed Maximum Price, if the Project is a Construction Manager at Risk project, whichever is applicable. Provided, however, no limitation herein shall limit Contractor's liability under the Contract Documents. Except as provided below, such bond shall be furnished to Owner before any work begins and not later than five business days after execution of the Contract by Owner. (If the Guaranteed Maximum Price is not known at the time that a Construction Manager at Risk contract is awarded, then the sum of the payment and performance bonds must each be in an amount equal to the Project budget. The Construction Manager at Risk shall deliver the bonds not later than the tenth day after the date the Construction Manager at Risk executes the Contract, unless the Construction Manager at Risk furnished a bid bond or other financial security acceptable to the Owner to the District to ensure that the Construction Manager will furnish the required payment and performance bonds when the Guaranteed Maximum Price is established.) All bonds shall be issued by a surety company licensed, listed and authorized to issue bonds in the State of Texas by the Texas Department of Insurance, and shall fully comply with Texas Insurance Code Section 3503.001 et seq. and Texas Government Code Chapter 2253, or their successors. The surety company shall have a rating of not less than "A-X" according to the latest posted ratings on the A.M. Best website, www.ambest.com. The surety company shall provide, if requested, information on bonding capacity and other projects under coverage and shall provide proof to establish adequate financial capacity for this Project. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, then the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by a reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus. Contractor shall immediately notify the Owner and Architect in writing if there is any change in: the rating; insolvency or receivership in any State; bankruptcy; right to do business in the State; or status of Contractor's sureties at any time until Final Completion.

§ 11.1.2.2 The Contractor shall deliver copies of the required bonds to the Owner and Architect not later than five business days after execution of the Contract by Owner. All bonds will be reviewed by the Architect for compliance

with the Contract Documents. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's Representative with Architect's recommendation.

§ 11.1.2.3 All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required Bonds on behalf of the Surety to affix thereto a certified and current copy of the power-of-attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.

§ 11.1.2.4 Bonds shall guarantee the faithful performance of all of the covenants, stipulations, and agreements of the Contract. Bonds shall be signed by an agent, resident in the State of Texas. If at any time during the continuance of the Contract, the Owner determines that the Contractor is unable to complete the Work in accordance with the Contract Documents, any of the Contractor's bonds become insufficient, the surety becomes insolvent, or the surety's rating drops below the required level, then the Owner shall have the right to require from the Contractor additional and sufficient sureties or other security acceptable to the Owner, which the Contractor shall furnish to the satisfaction of the Owner within ten (10) days after notice to do so. These contractual remedies are in addition to all remedies available by law. In default thereof, all payment or money due to the Contractor may be withheld until the Contractor provides additional surety or security.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor ~~becomes aware~~knows or should know of an impending or actual cancellation ~~or expiration~~ of any insurance required by the Contract Documents, the Contractor shall provide written notice to the Owner of such impending or actual cancellation ~~or expiration~~. Upon receipt of written notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of written notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage. At least 30 calendar days prior to the date of expiration of any policy required by Section 11.1, Contractor shall provide Owner written notice of the impending expiration.

§ 11.2 Owner's Insurance

§ 11.2.1 ~~The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.~~ The Owner shall be responsible for purchasing and maintaining property and casualty insurance no later than the date of Substantial Completion and such date of Owner responsibility shall be documented in the Certificate of Substantial Completion. If Owner occupies or uses any completed or partially-completed portion of the Work ~~on~~at any stage, then such occupancy or use must be consented to by the insurer and authorized by public authorities having jurisdiction over the Work. To the extent of overlap between Owner's property insurance and Contractor's builder's risk insurance, if any, Contactor's builder's risk shall be primary and non-contributory.

§ 11.2.2 Partial occupancy or use shall not commence until the insurance company providing this insurance has consented in writing, by endorsement or otherwise. Owner and Contractor shall take reasonable steps to obtain such consent and shall take no action without written mutual consent that would cause cancellation, lapse, or reduction of this insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 All insurance required herein shall contain a waiver of subrogation in favor of Owner on all claims arising out of the Project. The policies shall provide such waivers of subrogation by endorsement or otherwise. The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity whether or not: (1) ~~even though~~ that person or entity would otherwise have a duty of indemnification, contractual or otherwise; (2) ~~even though~~ that person or entity paid or did not pay the insurance premium directly or indirectly; or (3) ~~whether or not~~ the person or entity had an insurable interest in the damaged property.

§ 11.4 Loss of Use, and Business Interruption, ~~and Delay in Completion~~ Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. ~~The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.~~

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of ~~any applicable mortgagee clause and of~~ Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor and Architect of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor and the Architect shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor and/or the Architect do~~es~~ not object, the Owner shall settle the loss and the Contractor and Architect shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor and/or Architect timely object~~s~~ to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's or Owner's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect or Owner, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect or Owner may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor ~~shall~~ may be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or Work ~~or~~ failing to conform to the requirements of the Contract Documents ~~or Construction Documents~~, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.1.21 The Owner may make emergency repairs to the Work or take such other measures necessary under the circumstances, if the Contractor does not promptly respond to a notice of defect or nonconforming Work. Contractor shall be responsible to Owner for this cost if the reason for the repairs is attributable to the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover such costs, then the Contractor shall pay the difference to the Owner on demand.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof ~~or after the date for commencement of warranties established under Section 9.9.1,~~ or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the ~~Construction Documents or the~~ Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such written notice promptly after discovery of the condition. ~~During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty.~~ If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of written notice from the Owner or Architect, the Owner may correct the Work as provided in 12.2.2.1.1. Nothing contained in this Section 12.2 is intended to limit or modify any obligations under the law or under the Contract Documents, including any warranty obligations, expressed or implied. ~~it in accordance with Section 2.5.~~

§ 12.2.2.1.1 If the Contractor fails to perform the corrective Work, then Owner may perform corrective Work, at Contractor's cost. If Owner performs corrective Work, then Owner may also remove nonconforming Work and store the salvageable materials or equipment at Contractor's expense. If the Contractor does not pay all costs incurred by Owner within ten (10) days after written notice, then Owner may, upon ten (10) additional days' written notice, sell the removed materials and equipment in accordance with Owner's policies, and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, then the Contractor shall pay the difference to the Owner.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall ~~not~~ be extended by corrective Work performed by the Contractor pursuant to this Section 12.2, but only as to the corrected Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction ~~of~~ by the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.2.6 Contractor shall replace, repair, or restore any parts of the Project or furniture, fixtures, equipment, or other items placed therein (whether by Owner or any other party) that are- destroyed~~injured~~ or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or by defects in the Work.

§ 12.2.7 The provisions of this Section 12.2 apply to Work done by Subcontractors of the Contractor as well as Work done directly by employees of the Contractor. The provision for this Section 12.2.7 shall not apply to corrective work attributable solely to the acts or omissions of any separate contractor of Owner (unless Contractor is acting in such capacities). The cost to Contractor of performing any of its obligations under this Section 12.2.7 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.8 If, however, Owner and Contractor deem it inexpedient to require the correction of Work damaged or not done in accordance with the Contract Documents, then an equitable deduction from the Contract Sum shall be made by written agreement between Contractor and Owner. Until such settlement, Owner may withhold such sums as Owner deems just and reasonable from moneys, if any, due Contractor. The settlement shall not be unreasonably delayed by the Owner and the amount of money withheld shall be based on estimated actual cost of the correction to Owner.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

§ 13.1.1 The Contract shall be governed by the laws of the State of Texas, and any litigation shall be conducted in state district court. Mandatory and exclusive venue for any disputes shall be in Tarrant County, Texas, or if no county is specified, then in the county in which the Owner's main administration office is located. ~~place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. ~~Except as provided in Section 13.2.2, n~~Neither party to the Contract shall assign the Contract, in whole or in part, ~~as a whole~~ without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 ~~The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment~~. The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability or effect of the remainder of the Contact Documents.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner~~,~~ or Architect~~, or Contractor~~ shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made at appropriate times as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals which shall be included in the Cost of the Work. Provided, however, per Texas Government Code Chapter 2269, Owner shall bear all costs of construction materials engineering, testing and inspection services, and the verification testing

services necessary for acceptance of the facility by the Owner. The Contractor shall give the Architect timely written notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. ~~The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded.~~ The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Owner shall provide or contract ~~the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements~~ for such additional testing, inspection, or approval~~, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures~~. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense. Architect, Owner and Contractor shall cooperate for the timely scheduling of such tests and inspections.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including, but not limited to, those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect, with a copy to the Owner.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Undisputed ~~P~~payments due and unpaid under the Contract Documents shall bear interest from the date payment is overdue at the rate as provided by Texas Government Code Section 2251.025.~~the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~Any such payment shall be deemed overdue on the thirty-first day after Owner received Architect's invoice or Contractor's Certificate for Payment for the Architect, if Owner's Board of Trustees meets more than once per month. Any such payment shall be deemed overdue on the forty-sixth day after Owner receives Architect's invoice or Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets once a month or less frequently. No interest shall be due on sums properly retained by Owner, except as provided by law, or on disputed sums unpaid by Owner.

§ 13.6~~8~~ EQUAL OPPORTUNITY IN EMPLOYMENT

§ 13.6~~8~~.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, age, disability, sex, ~~or~~ national origin, or any class otherwise protected by District policy or law. The Contractor agrees to post in conspicuous places, available to employees and applicants, notices setting forth the Contractor's nondiscrimination policies.

§ 13.6~~8~~.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, age, disability, sex, ~~or~~ national origin, or any class otherwise protected by District policy or law.

§ 13.7~~9~~ RECORDS

§ 13.7~~9~~.1 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, Construction Documents, payment records, payroll records, daily reports, diaries, logs, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, other financial data and job meeting minutes applicable to the Project, in a manner which maintains the integrity of the documents. Job Records must be retained by Contractor for at least twelve (12) years after the date of Final Completion of the Project.

Within 10 days of Owner's request, Contractor shall make such Job Records available for inspection, copying and auditing by the Owner, Architect or their respective representatives, at Owner's central office.

§ 13.79.2 If Contractor is a Construction Manager at Risk, then Contractor shall also maintain, in accordance with the provisions of Section 13.7.9.1, the following: subcontract files, including proposals of successful and unsuccessful bidders, bid recaps and subcontractor payments; original estimates; estimating work sheets; general ledger entries detailing cash and trade discounts received; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to the Contract.

§ 13.79.3 Contractor shall keep a full and detailed financial accounting system and shall exercise such controls as may be necessary for proper financial management under this Contract; the accounting and control systems shall be satisfactory to the Owner and shall be subject to the provisions of Section 13.79.1.

§ 13.79.4 Contractor shall keep all ~~Construction~~Contract Documents related to the Project, subject to the provisions of Section 13.79.1, provided, however, Contractor shall not destroy said documents until Contractor has confirmed with Owner in writing that Owner has obtained a copy of all as-built drawings.

§ 13.79.5 In the event that an audit by the Owner reveals any errors/overpayments by the Owner, then the Contractor shall refund to the Owner the full amount of such overpayments within thirty (30) days of such audit findings, or the Owner, at its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.810 PROPRIETARY INTERESTS AND CONFIDENTIAL INFORMATION

§ 13.810.1 Neither Architect nor Contractor shall use the image or likeness of Owner's Project or Owner's official logo or emblem and any other trademark, service mark, or copyrighted or otherwise protected information of Owner, without Owner's prior written consent. Contractor and Architect shall not have any authority to advertise or claim that Owner endorses Architect or Contractor's services, without Owner's prior written consent.

§ 13.810.2 Neither Architect nor Contractor shall disclose any confidential information of Owner which comes into the possession of Architect or Contractor at any time during the Project, including but not limited to: pending real estate purchases, exchange, lease, or value; information related to litigation; the location and deployment of security devices; security access codes; student likenesses; student record information; employee information; or any other information deemed confidential by law.

§ 13.810.3 The parties acknowledge that, as a public entity in the State of Texas, Owner is subject to, and must comply with, the provisions of the Texas Public Information Act, Texas Government Code Section 552.001, *et seq*., and the Texas Open Meetings -Act, Texas Government Code, Section 551.001, *et seq*.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of ninety ~~3~~90 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment of undisputed sums due on an approved Certificate for Payment within the time stated in the Contract Documents~~;~~. ~~or~~
- **.4** ~~The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.~~

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, ~~under direct or indirect contract with the Contractor,~~ repeated suspensions, delays, or interruptions of the entire

Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, then, after the applicable time period, the Contractor may, upon ~~seven~~ten (10) days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination, ~~as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.~~

§ 14.1.4 If the Work is stopped for a period of ninety ~~6~~(90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon ~~seven~~ twenty (20) additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or ~~s~~Suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or ~~s~~Suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; ~~or~~
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents~~.~~;
- **.5** fails to furnish the Owner, upon written request, with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- **.6** engages in serious or repeated worker misconduct in violation of Article 3.3.2; ~~or~~
- .7 engages in conduct that would constitute a violation of state or federal criminal law, including but not limited to, the laws prohibiting certain gifts to public servants, or engages in conduct that would constitute a violation of the Owner's ethics or conflict of interest policies; or
- **~~7~~8** fails to proceed continuously and diligently with the construction and completion of the Work, except as permitted under the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, subject to any prior rights of the surety, ~~and upon certification by the Architect that sufficient cause exists to justify such action,~~ the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any further payment shall be limited to amounts earned to the date of termination.

§ 14.2.4 ~~If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.~~ If the costs of finishing the Work, including compensation for the Architects' services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, exceed the unpaid balance of the Contract Sum or Guaranteed Maximum Price~~,~~ (if the Project is a Construction

Manager at Risk project), then the Contractor and/or its Surety shall pay the difference to the Owner. The amount to be paid to the Owner shall be certified by Architect upon application. The obligation for payment shall survive termination of the Contract.

§ 14.2.5 The parties hereby agree that: 1) if an order for relief is entered on behalf of the Contractor, pursuant to Chapter 11 of the U.S. Bankruptcy Code; 2) if any other similar order is entered under any debtor relief laws; 3) if Contractor makes an assignment for the benefit of one or more of its creditors; 4) if a receiver is appointed for the benefit of its creditors; or 5) if a receiver is appointed on account of its insolvency, any such event could impair or frustrate Contractor's performance of the Contract Documents. Accordingly, it is agreed that upon occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents. Failure to comply with such request within ten (10) days of delivery of the request shall entitle Owner to terminate the Contract and to the accompanying rights set forth in Subparagraphs 14.2.1 through 14.2.6. In all events, pending receipt of adequate assurance of performance and actual performance in accordance with the Contract Documents, Owner shall be entitled to proceed with the Work with Owner's own forces or with other Contractors on a time and material or other appropriate basis, the cost of which will be charged against the Contract Sum.

§ 14.2.6 As required by Texas Government Code Chapter 2253, if a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, then the Surety shall promptly perform the Work, in full accordance with the plans, specifications and Contract Documents. Unless otherwise agreed in writing between the Surety and the Owner, the Surety shall complete the Work by the Surety entering into a Contract acceptable to Owner, with a Contractor acceptable to Owner, and shall obtain new Payment and Performance Bonds as required by law.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum, Guaranteed Maximum Price, and Contract Time ~~shall~~may be adjusted, by mutual written agreement, for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. ~~Adjustment of the Contract Sum shall include profit.~~ No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. Furthermore, if this Contract is a multi-year contract funded through Owner's current general funds that are not bond funds, then the Owner's Board of Trustees has the right to not appropriate adequate monies for the next fiscal year and to terminate this Contract at the end of each fiscal year during the term of the Contract, without the Owner incurring any further liability to Contractor as a result of such termination.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed~~; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.~~and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination. Such payment shall not cause the Contract Sum, or Guaranteed Maximum Price, if the Project is a

Construction Manager at Risk Project, to be exceeded. Such payment shall not include overhead and profit for Work not executed.

§ 14.4.4 Upon determination by a Court of competent jurisdiction that termination of the Contractor pursuant to Section 14.2 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Section 14.4, and Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Section14.4

ARTICLE 15 CLAIMS AND DISPUTES OF CONTRACTOR

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by the Contractor ~~one of the parties~~ seeking, as a matter of right, payment of ~~money~~additional compensation under the Contract Documents, interpretation of the Contract Document terms, ~~extension of time,~~ a change in the Contract Time~~,~~ ~~-~~or other relief with respect to the terms of the Contract. ~~The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.~~ The responsibility to substantiate Claims shall rest with the ~~party~~Contractor ~~making the Claim.~~ This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Litigation ~~Claims~~

The Owner and Contractor shall commence all litigation ~~Claims and causes of action against the other and arising out of or related to the Contract,~~ whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the ~~binding~~ dispute resolution method selected in the Agreement and within the period specified by applicable law, but in ~~any~~ the case of the Owner, not more than 12~~0~~ years after the date of Final~~Substantial~~ Completion of the Work. The Owner and Contractor waive all ~~Claims and~~ causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by ~~either~~ the ~~Owner or~~ Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the ~~other party~~Owner and to the ~~Initial Decision Maker with a copy sent to the~~ Architect~~, if the Architect is not serving as the Initial Decision Maker~~. Claims by Contractor ~~either party~~ under this Section 15.1.3.1 ~~shall~~ must be initiated within 21 calendar days after occurrence of the event giving rise to such Claim or within 21 calendar days after the Contractor ~~claimant~~ first knew or should have known ~~recognizes~~ the condition giving rise to the Claim, whichever is earlier ~~later~~. Claims must be initiated by written notice titled "Notice of Claim" ("Notice") and sent to the Architect and Owner's designated representatives. The Notice shall clearly set out the specific matter of complaint, and the impact which may occur or have occurred as a result thereof, to the extent that the impact can be assessed at the time of the Notice. If the impact cannot be assessed as of the date of the Notice then the Notice shall be amended at the earliest date that is reasonably possible. It is imperative that Owner receive timely specific Notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly. A notice of intent to sue for monetary damages must be given within ninety-one (91) days after the occurrence of the event giving rise to such claim or within ninety-one (91) days after the Contractor first knew or should have known of the condition giving rise to the cause of action, whichever is earlier or the cause of action for monetary damages shall be waived. Pursuant to Texas Civil Practices and Remedies Code Section 16.071, Contractor agrees that this is a reasonable notice requirement.

§ 15.1.3.2 Claims by ~~either~~ the ~~Owner or~~ Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7, as amended, and Article 14, as amended, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make undisputed payments for Work performed in accordance with the Contract Documents.

§ 15.1.5 Claims for Additional Cost or An Increase in the Contract Sum or Guaranteed Maximum Price

If the Contractor wishes to make a Claim for additional cost or an increase in the Contract Sum or Guaranteed Maximum Price, written notice as provided in Section 15.1.3 shall be given to Owner and Architect ~~before proceeding to execute the portion of the Work that is the subject of the Claim~~. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. The Architect will promptly investigate such Claim and report findings and a recommended resolution in writing to the Owner and Contractor. If the Claim is approved by Owner's Board of Trustees, or Owner's representative if provided for herein, then Contractor shall proceed with the execution of the Work that is the subject matter of the Claim. If the Claim is rejected by the Owner, then Contractor may pursue alternative dispute resolution as provided for in the Contract Documents.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of ~~cost and of~~ probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and prevented the execution of major items of work on normal working days. ~~had an adverse effect on the scheduled construction~~. "Adverse weather conditions" means unusually severe weather which is beyond the normal weather recorded and expected for the locality and/or the season or seasons of the year.

§ 15.1.6.3 The Contractor shall anticipate and include in the construction schedule rain days due to adverse weather conditions in accordance with the rainfall table below. A rain day is defined as a day when rainfall exceeds one-half (.5) inch during a 24-hour period. The number of rain days expected for each month is as follows:

Note: Prior to the execution of the Contract, Owner shall fill in the blanks below:

January	[ ] calendar days	July	[ ] calendar days
February	[ ] calendar days	August	[ ] calendar days
March	[ ] calendar days	September	[ ] calendar days
April	[ ] calendar days	October	[ ] calendar days
May	[ ] calendar days	November	[ ] calendar days
June	[ ] calendar days	December	[ ] calendar days

§ 15.1.6.4 Time extensions may be granted for rain days in any month when the cumulative number of rain days during that month exceeds the number scheduled, provided that the rainfall prevented the execution of major items of work on normal working days. No day will be counted as a rain day when substantial Contractor forces are able to perform Work on the Project for more than fifty percent (50%) of the usual workday or when the stage of the Work on the Project is not adversely impacted. The number of rain days shown in the above schedule for the first and last months of the Contract will be prorated in determining the total number of rain days expected during the period of the Contract.

§ 15.1.6.5 No extension of time shall be made to the Contractor because of hindrances or delays from any cause which is the fault of Contractor or Contractor's Subcontractors or under Contractor's control. Claims for extension of time may only be considered because of rain delays, or because of hindrances or delays which are the fault of Owner and/or under Owner's control, but only to the extent that Substantial Completion of the Project is adjusted beyond the original Substantial Completion date. Only claims for extension of time shall be considered because of hindrances or delays not the fault of either Contractor or Owner, but only to the extent that Substantial Completion of the Project exceeds the Substantial Completion date established for the Work. Board approval shall be required for any extension of time. No damages shall be paid for delays. Contractor shall only be entitled to time extensions per the terms of the Contract Documents.

§ 15.1.6.6 Requests for time extension shall be submitted on a monthly basis and shall specify the time delay, the cause of the delay, and the responsible party for the delay, whether Contractor, Owner, rain day, or other. No claims for damages for delay shall be made by Contractor. Any claim not submitted under the terms of this Section shall be waived.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor ~~and Owner~~ waives all Claims against Owner ~~each other~~ for consequential damages arising out of or relating to this Contract, including, but not limited to, any amount owed as compensation for the increased cost to perform the Work as a direct result of Owner-caused delays or acceleration. ~~This mutual waiver includes~~

.1 ~~damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and~~

.2 ~~damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.~~

~~This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14.~~ Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 ~~Initial Decision~~Resolution of Claims and Disputes

§ 15.2.1 ~~Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.~~ Recommendation of Architect. Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for written recommendation. An initial recommendation by the Architect shall be required as a condition precedent to mediation or litigation of all Claims by the Contractor arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no recommendation having been rendered by the Architect.

§ 15.2.2 ~~The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.~~ The Architect ~~wi~~shall review Claims and within ten days of the receipt of the Claim take one of the following actions: (1) request additional supporting data from the Contractor, or (2) make a written recommendation to the Owner, with a copy to the Contractor.

§ 15.2.3 In evaluating Claims, the Architect may, ~~Initial Decision Maker may,~~ but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect~~Initial Decision Maker~~ in making a written recommendation.~~rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense~~.

§ 15.2.4 If the Architect ~~Initial Decision Maker~~ requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either ~~(1)~~ provide a response on the requested supporting data, ~~(2)~~ advise the Architect~~Initial Decision Maker~~ when the response or supporting data will be furnished, or ~~(3)~~ advise the Architect ~~Initial Decision Maker~~ that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 ~~The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision~~

~~Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~ Following receipt of the Architect's written recommendation regarding a Claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Sum or Guaranteed Maximum Price and/or Contract Time. If no agreement can be reached, then either party may request mediation of the dispute pursuant to Section 15.3.

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.3 ~~Mediation~~Alternative Dispute Resolution

§ 15.3.1 ~~Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.~~Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived under the terms of the Contract Documents, shall, after written recommendation by the Architect or 30 days after submission of the Claim to the Architect, be subject to mediation at the request of either party. Owner and Contractor expressly agree that mediation shall be a condition precedent to the initiation of any litigation arising out of such Claims. Claims for injunctive relief shall not be subject to this Section.

§ 15.3.2 ~~The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~ The parties shall endeavor to resolve their Claims by mediation. Requests for mediation shall be filed in writing with the other party to the Contract. Mediation shall be subject to and in accordance with Chapter 154 of the Texas Civil Practice & Remedies Code. Mediation shall be conducted by a mutually-agreed-upon mediator. In the event that the parties are unable to agree on a mediator, then the parties shall jointly request the appointment of a neutral mediator by a District Judge in the county in which the Project is located.

§ 15.3.3 ~~The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.~~ The parties shall share the mediator's fee equally and, if any filing fee is required, shall share said fee equally. Mediation shall be held within the county where the Owner's main administrative office is located, unless another location is mutually agreed upon by the parties. Agreements reached in mediation shall be reduced to writing, considered for approval by the Owner's Board of Trustees, signed by the parties if approved by the Board of Trustees, and, if signed, shall thereafter be enforceable as provided by the laws of the State of Texas.

§ 15.3.4 Any claim not resolved in mediation shall be subject to litigation pursuant to Section 13.1.

§ 15.4 No Arbitration

§ 15.4.1 ~~If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~ Notwithstanding anything to the contrary in the

Contract Documents or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

§ 15.4.1.1 ~~A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

§ 15.4.2 ~~The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

§ 15.4.3 ~~The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

§ 15.4.4 ~~**Consolidation or Joinder**~~

§ 15.4.4.1 ~~Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

§ 15.4.4.2 ~~Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

§ 15.4.4.3 ~~The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

§ 15.5 Contractor stipulates that Owner is a political subdivision of the State of Texas, and, as such, enjoys immunities from suit and liability provided by the Constitution and laws of the State of Texas. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically authorized by law.

§ 15.6 In any adjudication under this Agreement, reasonable and necessary attorneys' fees may be awarded to the prevailing party.

EXECUTED this _____ day of _____, 2018

OWNER:	**CONTRACTOR:**
_____	_____
(Printed Name)	**By:**
Title: President, Board of Trustees	**Title:**
Eagle Mountain-Saginaw Independent School District	

ATTEST:

_____

By: _____

Title: Secretary, Board of Trustees

Eagle Mountain-Saginaw Independent School District

DOCUMENT 00 73 46

PREVAILING WAGE RATES

North Texas Construction Industry Wage Survey

Attention is called to the fact that the Contractor must comply with all Federal, State and Local labor laws, including Chapter 2258 Texas Government Code Title 10, which requires that the Contractor pay not less than the following prevailing wage rates and rates for legal holidays and overtime, which have been ascertained by the awarding body, as follows:

Classification	Avg. Hrly Rate	Health/ Welfare	Pension	Vacation	Total Package
AC Mechanic	$26.62	$3.82	$2.00	$1.40	$33.84
AC Mechanic Helper	$15.59	$3.12	$2.37	$1.07	$22.15
Acoustical Ceiling Installer	$15.90	$0.53	$0.54	$0.53	$17.50
Bricklayer/Stone Mason	$23.51	$1.63	$0.00	$0.00	$25.14
Bricklayer/Stone Mason Trainee	$16.58	$1.63	$0.00	$0.00	$18.21
Bricklayer/Stone Mason Helper	$17.50	$1.63	$0.00	$0.00	$19.13
Carpenter	$17.37	$4.90	$2.59	$1.25	$26.12
Carpenter Helper	$14.90	$0.00	$0.00	$0.00	$14.90
Concrete Pump	$20.00	$4.93	$3.00	$0.00	$27.93
Concrete Finisher	$16.14	$4.93	$2.59	$0.00	$23.66
Concrete Form Builder	$14.66	$0.00	$0.00	$0.00	$14.66
Drywall Mechanic	$17.76	$0.63	$0.64	$0.63	$19.66
Drywall Helper	$14.95	$0.54	$0.54	$0.53	$16.56
Electrician (Journeyman)	$26.03	$2.30	$1.04	$0.85	$30.21
Electrician Apprentice (Helper)	$18.48	$1.43	$0.71	$0.55	$21.16
Electronic Technician	$26.68	$4.99	$2.23	$1.57	$35.47
Electronic Technician Helper	$26.00	$0.00	$0.00	$0.00	$26.00
Glazier	$20.73	$2.16	$0.66	$1.58	$25.13
Glazier Helper	$14.72	$2.14	$0.59	$0.70	$18.15
Laborer Common	$13.63	$3.99	$2.01	$0.54	$20.18
Laborer Skilled	$16.95	$2.54	$1.87	$0.76	$22.12
Lather	$17.54	$0.69	$0.69	$0.68	$19.60
Metal Installer (Miscellaneous)	$21.50	$3.41	$3.23	$1.08	$29.22
Metal Installer Helper (Miscellaneous)	$15.40	$3.10	$2.31	$0.77	$21.58

Classification	Avg. Hrly Rate	Health/ Welfare	Pension	Vacation	Total Package
Painter	$15.44	$0.00	$0.00	$0.00	$15.44
Painter Helper	$11.45	$0.00	$0.00	$0.00	$11.45
Pipefitter	$22.12	$4.06	$1.01	$1.31	$28.50
Pipefitter Helper	$16.17	$2.89	$0.68	$1.28	$21.02
Plasterer	$18.36	$0.65	$0.65	$0.64	$20.30
Plasterer Helper	$18.31	$3.49	$0.88	$0.76	$23.44
Plumber	$25.60	$4.19	$1.15	$1.47	$32.41
Plumber Helper	$17.56	$3.00	$0.68	$1.75	$22.99
Reinforcing Steel Setter	$21.35	$1.01	$0.35	$0.20	$22.91
Reinforcing Steel Setter Helper	$18.00	$1.00	$0.35	$0.00	$19.35
Roofer	$17.65	$0.00	$0.00	$0.00	$17.65
Sheet Metal Worker	$21.54	$3.63	$0.89	$1.08	$27.15
Sheet Metal Worker Helper	$16.58	$3.32	$0.67	$1.02	$21.59
Sprinkler System Installer	$21.00	$0.00	$0.00	$0.00	$21.00
Sprinkler System Installer Helper	$15.00	$0.00	$0.00	$0.00	$15.00
Steel Worker Structural	$21.44	$2.90	$3.20	$0.00	$27.54
Steel Worker Structural Helper	$13.65	$0.00	$0.00	$0.00	$13.65
Crane, Clamsheel, Backhoe, Der-rick, D'Line Shovel	$19.76	$4.01	$2.67	$1.03	$27.47
Forklift	$16.07	$3.03	$0.99	$0.88	$20.96
Foundation Drill Operator	$19.50	$0.87	$0.00	$0.38	$20.75
Front End Loader	$17.00	$1.82	$0.73	$1.06	$20.60
Truck Driver	$16.52	$3.55	$2.23	$0.73	$23.02
Waterproofer	$15.24	$0.00	$0.00	$0.00	$15.24
Welder	$21.53	$3.28	$0.97	$1.21	$26.99

DOCUMENT 00 73 50

WEATHER TABLE

MONTH	AVERAGE DAYS RAIN (1)	INCHES RAINFALL (2)	SNOW/ICE PELLETS (3)
JANUARY	6.6	2.13	0.1
FEBRUARY	6.4	2.66	0.2
MARCH	7.8	3.49	0.1
APRIL	6.6	3.07	0.0
MAY	9.1	4.90	0.0
JUNE	8.0	3.79	0.0
JULY	4.5	2.16	0.0
AUGUST	4.8	1.91	0.0
SEPTEMBER	5.5	2.55	0.0
OCTOBER	7.4	4.22	0.0
NOVEMBER	6.4	2.71	0.0
DECEMBER	6.7	2.55	0.1
ANNUALLY	79.8	36.14	0.5

(1) Mean number of days rainfall, 0.01" or more.
(2) Average normal precipitation, in inches.
(3) Mean number of days 1.0" or more.
* Less than 0.05".

This table is based on information reported from Dallas/Fort Worth International Airport, Texas. Latitude 32.898° N, longitude 97.019° W, elevation (ground) 560 feet.

Means are based on records covering a period of 30 years. Normals based on record for the 1981-2010 period.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:
   1. Document 00 21 16 - Instructions to Proposers.
   2. Document 00 70 00 - General Conditions of the Contract for Construction (Modified): Provisions for use of site; Owner occupancy; Relations of Contractor - subcontractors.
   3. Section 01 32 16 - Construction Progress Schedules: Format of work schedule.
   4. Section 01 45 23 - Testing and Inspection Services.
   5. Section 01 50 00 - Temporary Facilities and Controls.

1.2 DESCRIPTION

A. The work comprises the construction of Bryson ES, Elkins ES, Eagle Mountain ES, & Boswell HS for Eagle Mountain-Saginaw Independent School District, Fort Worth, Texas, as shown on the drawings and described in the specifications. The work will be done under one lump sum contract.

B. Indication on the drawings or mention in the specifications of articles, materials, operations or methods requires that the Contractor provide each item indicated or mentioned of the quality or subject to the qualifications noted, and perform according to the conditions stated each operation described and provide therefor all necessary labor, equipment, services and incidentals.
   1. Subcontractors are responsible for examining the architectural drawings for structural, mechanical, electrical, and plumbing items. Items shown on these drawings shall be furnished by the appropriate subcontractor.

1.3 CONDITIONS OF THE CONTRACT

A. The General Conditions (Modified), bound herewith as preceding portions of these specifications, form a part thereof and shall govern the work under each section.

1.4 EXISTING SITE CONDITIONS

A. Visit and examine the site. Upon award of the Contract, the Contractor shall accept the condition of the site before beginning the work required.

1.5 SPECIAL REQUIREMENTS

A. The present buildings house operating facilities that must continue in operation during the construction period, except as the Architect and Owner may otherwise direct. Plumbing, heating, ventilating, electrical and telephone systems shall continue to function with a minimum of interruptions in service. Do not block required fire exits.

B. Assume responsibility for the protection of areas of work and provide and maintain protections required. Protect existing surfaces of the building and equipment, both interior and exterior, as required during the construction period. Provide necessary dust screens, drop cloths and temporary walls and/or coverings as may be required for protection. Existing surfaces that are damaged due to construction shall be patched or replaced to original condition.

C. Where designated on the drawings, salvage, relocate and reinstall certain items. Existing items so designated shall be properly installed, securely fastened as required, set plumb and level and left complete and operational. Exercise extensive care in relocating such items so as to prevent damage. Other existing building materials indicated to be removed or demolished, unless noted otherwise or claimed by the Owner shall become property of the Contractor and shall be removed from the site immediately.

D. Wherever exterior walls are to be demolished or existing doors replaced, the exposed portion of the existing building shall be protected by the Contractor against the elements, construction debris and intrusion by unauthorized persons, by means subject to approval of the Architect.

E. Execute Certificate of Substantial Completion for each designated portion of work prior to Owner occupancy. Following execution of a Substantial Completion Certificate for a designated portion of the work, the Contractor shall permit:
   1. Access for Owner personnel.
   2. Use of parking facilities for the benefit of the Owner.
   3. Operation of HVAC and electrical systems for the benefit of the Owner.

   Despite partial Owner occupancy, the Contractor shall remain responsible for portions of the work which have not attained Substantial Completion and for which a Substantial Completion Certificate, which shall designate the date on which the Owner shall become responsible for utilities, maintenance, security, damage to the work and insurance, has not been executed.

F. The loop fire lane and fire hydrants are required by the City to be in place and operational during construction.

1.6 CONTRACTOR USE OF PREMISES

A. Limit use of premises for work, for storage and for access to allow for Owner occupancy.

B. Coordinate use of premises under direction of Owner.

C. Assume full responsibility for protection and safekeeping of products under this contract.

D. Obtain and pay for use of additional storage or work areas needed when required for operations under this Contract.

E. During construction the Owner will continue to perform normal activities in and around the adjacent existing building. Proper and safe access to the Owner-occupied areas shall be maintained. Interruption of mechanical and electrical services to the building shall be only at such times and for lengths of time as approved by the Owner.

F. There shall be no storage of materials or equipment in the occupied portions of the existing building. There shall be no fires on the site or in the building. There shall be no dumping on Owner's property.

G. Worker Identity Badging Requirements: Provide construction personnel (including subcontractors and suppliers regularly visiting the project site) with identification badges, with photograph. Identification badges shall be worn visibly by construction personnel on the construction site or on Owner’s property. NO EMPLOYEE WILL BE PERMITTED ON SITE WITHOUT THIS BADGE DISPLAYED ON THE EMPLOYEE. Contractor must assure that the Crisis Management contact information is provided on the reverse side of each worker’s badge. Temporary or visitor badges will be provided for persons who are identified as having an infrequent or temporary legitimate business need for access to the site.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed on the project site during normal business working hours of 6:00 a.m. to sundown, Monday through Friday. If within 300 feet of an occupied residence, 7:00 a.m. to 8:00 p.m. or City ordinance whichever is more restrictive.
   1. Weekend Hours: Comply with City of Fort Worth 9:00 a.m. to 8:00 p.m. on Saturday. No work shall be performed on Sundays, unless specifically allowed by City and Owner.
   2. Early Morning Hours: Comply with City noise ordinances for restriction of early-morning concrete pours and other noisy construction activities. Owner’s testing laboratory personnel will be available only during on-site work hours listed above.

B. Reference *Instructions to Proposers* for specific instructions.

C. Work Restrictions within Existing Buildings: Work shall be generally performed per requirements in *Instructions to Proposers*.

D. During student holidays when the faculty and staff may be on campus, extent of work and utility interruption shall be coordinated with the Owner in advance. On dates designated as STAAR testing days, work within the existing building is not allowed and work in other areas may need to be limited to keeping down the amount of noise and distraction for the students. Work on these days shall be coordinated with the Owner in advance.

1.8 OWNER-FURNISHED PRODUCTS

A. Contractor Responsibilities
   1. Protect products from damage.
   2. Repair or replace items damaged by Contractor.
   3. Make all necessary electrical and plumbing service connections to Owner supplied Equipment.

B. Schedule of Owner-furnished items
   1. Soap Dispensers
   2. Refer to Drawings.

1.9 COORDINATION

A. Drawing details and other sections of these specifications covering work connected with or relating to that specified under a specific heading shall be examined for conditions which may affect that part of the work. Failure to do so will not relieve those furnishing materials and/or labor under a specification heading from supplying materials or performing work reasonably necessary to properly coordinate their work with that of other trades.

1.10 LAYING OUT WORK, MEASUREMENTS

A. Employ a competent engineer or surveyor to establish and maintain lines and levels. Establish and maintain at least two elevation bench marks remote from each other and located outside the building area. Set alignment and location stakes.

B. Verify measurements at the building. No extra compensation will be allowed for differences between actual dimensions and dimensions indicated on the drawings. Figured dimensions and measurements taken at the site shall take precedence over scaled dimensions.

1.11 DISCREPANCIES

A. In case of discrepancies within the drawings, within the specifications, or between the drawings and specifications, the better quality and greater quantity, in the opinion of the Architect, shall be furnished and installed.

1.12 PIPING

A. Should active piping or conduit be encountered below grade within the building structure and be found at variance with the known conditions indicated by the drawings and specifications, said piping and/or conduit shall be relocated as required by the Architect, and the contract sum shall be fairly adjusted on the basis of the cost of labor and materials. The Contractor shall provide temporary support of active piping and conduit encountered in the excavations until permanently supported or removed. The Contractor shall cut off and cap or plug abandoned lines at least 3 ft. outside the building lines. Conform to the applicable requirements of the locality or governing agency.

1.13 PROTECTION

A. General: Limit use of the premises to construction activities in areas indicated. Allow for Owner occupancy in adjacent spaces and around the site.
   1. Confine operations to areas within Contract limits indicated. Portions of the building which are outside the areas construction operations are indicated are not to be disturbed.
   2. Keep driveways and entrances serving the premises clear of debris and available to the Owner and the Owner's employees. Do not use these areas for parking or storage of materials without prior approval. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Do not dispose of organic and hazardous material on site, either by burial or by burning. Disposable material and trash must be removed properly.

B. Assume responsibility for the premises and provide and maintain protections required by the governing laws, regulations and ordinances. The Contractor shall be responsible for loss or damage caused by him or his workmen to the property of the Owner or to the work or materials installed, and shall make good loss, damage or injury without cost to the Owner.

C. The protection of adjacent property shall include but will not necessarily be limited to the erection and maintenance of shoring, underpinning and fences as necessary to protect and support existing work to be left in place.

D. Finished floors shall be protected against damage by workmen and equipment during the work. Where materials are carried into the building, the building floors shall be covered to protect the work against dirt or grit being ground in.

E. Where existing roofing, flashing, exterior walls, doors and windows are removed, the openings and exposed portions of the construction shall be covered and protected so as to be weathertight until new work is in place.

F. Where work is being done on the existing building, the furniture, fixtures and equipment in the building shall be covered with heavy plastic sheeting or clean tarpaulins to protect the property against damage and stains. The furniture and equipment shall not be removed from the building.

G. Trees and shrubs on the site which do not have to be removed for the new work shall be protected against damage. No Contractor shall remove or trim trees and shrubs in the area without the express approval of the Architect.

H. Send proper notices, make necessary arrangements and perform other services required for the care, protection and maintenance of Public Utilities, including fire plugs and wires and other items of this character on and around the building site.

I. Maintain accessible building exits required by the City during construction. Protection of these exits shall include dust-proof enclosures, illumination and exit lighting required.

J. While school is in session, provide appropriate measures to control the migration of dust and odors into occupied areas of the school.

1.14 CUTTING AND PATCHING

A. Cutting and chasing of existing construction for relocation of mechanical and electrical work and for installation of pipes and ducts will be done by the trades concerned. Patching and finishing shall be done by the Contractor. This work shall be done with proper tools and by careful workmen of the particular trade to which such work belongs and shall be done without extra cost to the Owner.

1.15 RECORD DRAWINGS

A. Maintain a complete clean set of drawings and Project Manual in the project field office for the sole purpose of recording "installed" conditions. Installed conditions shall include addendum items, change orders, or other items which come up during the construction phase which deviate from the Construction Documents. Changes made in these drawings and Project manual in connection with the final construction and installation shall be neatly made in red ink. Upon completion of the project, the marked set of drawings and Project Manual shall be delivered to the Architect for subsequent transmittal to the Owner. These drawings shall be maintained to reflect the current conditions of the work and changes shall be reviewed on a monthly basis with the Architect’s representative. The Contractor's updating of the "installed" condition drawings and Project Manual shall be a prerequisite to the monthly review of the Contractor's payment request by the Architect's representative.

1.16 INSTRUCTIONS CONCERNING ASBESTOS

A. In the event the Contractor encounters on the site material reasonably believed to be asbestos which has not been rendered harmless, the Contractor shall immediately stop work in the area affected and report the condition to the Owner in writing. If, in fact the material is asbestos and has not been rendered harmless, the work in the affected area shall not thereafter be resumed until the asbestos has been removed or rendered harmless by the Owner. The work in the affected area shall be resumed in the absence of asbestos, or when it has been rendered harmless, by written agreement of the Owner and Contractor.

B. The Contractor will not be required to perform without consent work relating to asbestos.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements governing allowances.
   1. Certain materials and equipment are specified in the contract documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by change order.

B. Related Requirements:
   1. General Conditions of the Contract for Construction.
   2. Section 01 22 00 - Unit Prices; procedures for using unit prices.
   3. Section 01 32 16 - Construction Progress Schedules: Product delivery and installation dates.
   4. Individual Specifications Sections Listed Under Schedule of Allowances: Specification of products and installation under allowances.

1.2 COSTS INCLUDED IN ALLOWANCES

A. Cost of product to Contractor or subcontractor, less applicable trade discounts.

B. Delivery to site.

C. Applicable taxes.

1.3 CONTRACTOR COSTS INCLUDED IN CONTRACT SUM

A. Products handling at site, including unloading, uncrating and storage.

B. Protection of products from elements and from damage.

C. Labor for installation and finishing.

D. Other expenses required to complete installation.

E. Contractor overhead and profit.

1.4 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the contract sum will be adjusted accordingly by change order.

B. Submit any claims for anticipated additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

C. Submit documentation for actual additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

D. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.

1.5 ARCHITECT RESPONSIBILITIES

A. Consult with Contractor in consideration of products, suppliers and installers.

B. Select products, obtain Owner's written decision, and transmit full information to Contractor as follows
   1. Manufacturer, product, model or catalog number, accessories, attachments and finishes.
   2. Supplier and installer as applicable.

3. Cost to Contractor, delivered to site (and installed, if so specified).

1.6 CONTRACTOR RESPONSIBILITIES

A. At the earliest practical date after award of the contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the work.

B. Assist Architect in determining suppliers; and installers; obtain proposals when requested.

C. Make recommendations for Architect consideration.

D. Promptly notify Architect of any reasonable objections against supplier or installer.

E. On notification of selection execute purchase agreement with designated supplier and installer.

F. Arrange for and process shop drawings, product data and samples.

G. Arrange for delivery. Promptly inspect products upon delivery for completeness, damage and defects. Submit claims for transportation damage.

H. Install, adjust and finish products.

I. Provide warranties for products and installation.

1.7 CORRELATION WITH CONTRACTOR SUBMITTALS

A. Schedule shop drawings, product data, samples and delivery dates, in progress schedule for products selected under allowances.

PART 2 - PRODUCTS – Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate allowance work with related work to ensure proper integration and interface.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Allow the lump sum of $20,000.00 for Graphics Package.

B. Allowance No. 2: Allow the lump sum of $125,000.00 Owner’s Betterment for the changes requested by the Owner.

END OF SECTION

SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for unit prices.

B. Related Requirements:
1. Document 00 42 00 - Proposal Form
2. Section 01 29 00 - Payment Procedures: Procedures for submitting and handling Change Orders.
3. Section 31 32 00 - Soil Stabilization
4. Section 31 63 29 - Drilled Concrete Piers.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders as a price per unit of measurement for materials or services added to or deducted from the contract sum by appropriate modification, if the estimated quantities of work required by the contract documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, profit and applicable taxes.

B. Measurement and Payment: Refer to individual specification sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those sections.

C. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Applications and Certificates for Payment.
   2. Change Order Procedures.
   3. Schedule of Values: Submit to the Architect the Schedule of Values allocated to various portions of the work within five days after "Notice-to-Proceed". Upon request of Architect, support values with data which will substantiate their correctness.

B. Related Requirements:
   1. Conditions of the Contract for Construction.
   2. Section 01 32 16 - Construction Progress Schedules.
   3. Section 01 77 00 - Closeout Procedures.
   4. Section 01 78 39 - Project Record Documents.

1.2 APPLICATIONS AND CERTIFICATES FOR PAYMENT

A. Provide a separate Application for Payment for each school.

B. Progress payments shall be made as the work proceeds at intervals stated in the Contract.

C. Work covered by progress payments shall, at the time of payment, become the property of the Owner.

D. Form of Application and Certificate for Payment shall be notarized AIA Document G702 - Application and Certification for Payment, supported by AIA document G703 - Continuation Sheet. Submit two hard copies. Architect will retain a digital copy and return signed hard copies to the Owner and Contractor.

E. Conditions governing regular schedule for applications, payment and retainage are as stated in the Contract.

F. With each Application for Payment, Contractor shall certify that such Application for Payment represents a just estimate of cost reimbursable to Contractor under terms of Contract.

1.3 CONSTRUCTION CHANGE ORDER PROCEDURES

A. Contractor to submit to Architect within five days of execution of Owner/Contractor Agreement name of individual authorized to accept changes on behalf of Contractor, and to be responsible for informing others in Contractor's employ of changes in the work.

B. Change Order forms will be furnished and issued by Architect.

C. Contractor Documentation of Changes:
   1. Maintain detailed records of work done on an accounting basis acceptable to Architect and Owner. Provide full information required for evaluation of proposed changes.
   2. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
   3. On request, provide additional data to support computations:
      a. Quantities of products, labor and equipment.
      b. Insurance and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   4. Support each request for additional costs, and for work proposed on a time and material basis, with description of products, equipment, cost of labor and subcontracts, completely documented.
   5. Computation for changes in work will be computed in one of the manners described in the Conditions of the Contract.

D. Initiation of Changes:
   1. Architect may submit Proposal Request which includes detailed description of change with supplementary or revised drawings and specifications.
   2. Contractor may initiate a proposed change by submittal of a request to Architect describing proposed change with statement of reason for change, and proposed effect on Contract Sum and Contract Time with full documentation and a statement of the effect on work of separate contractors. Document any requested substitutions in accordance with SECTION 01 62 00 - PRODUCT OPTIONS. Submission of such requests and receipt of same by Architect does not mean acceptance, or approval of proposed change.

E. Authorization:
   1. The Owner may request, through the Architect, a Construction Change Directive, in writing, instructing Contractor to proceed with changes of all or in part of work, for subsequent inclusion in a Change Order that is pending. Directive will propose basis for necessary adjustments, if any, to Contract Sum or Time.
   2. Changes that affect Contract Sum and/or Contract Time will require a Change Order signed by the Owner and the Architect. Contractor's signature indicates agreement. Other orders, written or oral, by the Owner through the Architect or by the Architect shall be treated as a Change Order only if Contractor gives Owner proper written notice as described in Conditions of Contract.
   3. Promptly execute the change in work only upon receipt of approved Change Order or Owner's written Construction Change Directive.

F. Execution:
   1. Architect will issue Change Orders for signatures of parties as provided in Conditions of Contract.
   2. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust Contract Sum as shown on Change Order.
   3. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by Change, and resubmit Schedule.
   4. Promptly enter Changes in Project Record Documents.

1.4 SCHEDULE OF VALUES FORM AND CONTENT

A. Provide a separate Schedule of Values for each school and provide a breakdown between additions and renovations for major items of work.

B. Type schedule on 8-1/2" x 11" white paper; Contractor's standard forms and automated printout will be considered for approval by Architect upon Contractor's request. Identify schedule with:
   1. Title of project and location.
   2. Architect and Architect's project number.
   3. Name and address of Contractor.
   4. Contract designation.
   5. Date of submission.

C. Follow the table of contents of this project manual as the format for listing component items.
   1. Identify each line item with the number and title of the respective major section of the specifications.

D. For each major line item list sub-values of major products or operations under the item.

E. For the various portions of the work:
   1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
   2. For items on which progress payments will be requested for stored materials, break down the value into:
      a. Cost of the materials, delivered and unloaded, with taxes paid.
      b. Total installed value.

F. The sum of values listed in the schedule shall equal the total contract sum.

G. Indicate separate value associated with materials and labor.

H. Re-submittal: After review by Architect, revise and resubmit schedule as necessary.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Coordination of work of the contract.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Sequence of construction and Owner occupancy.
2. Section 01 31 19 - Project Meetings.
3. Section 01 62 00 - Product Options.
4. Section 01 73 29 - Cutting and Patching.
5. Section 01 77 00 - Closeout Procedures: Closeout submittals.

1.2 DESCRIPTION

A. Coordinate scheduling, submittals and work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Coordinate sequence of work to accommodate Owner occupancy as specified in SECTION 01 11 00 - SUMMARY OF WORK.

1.3 MEETINGS

A. In addition to progress meetings specified in SECTION 01 31 19 - PROJECT MEETINGS, hold coordination meetings and pre-installation conferences with personnel and subcontractors to ensure coordination of work.

1.4 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Coordinate work of various sections having interdependent responsibilities for equipment, such as installing, connecting to and placing in service.

C. Coordinate requests for substitutions to ensure compatibility of space, of operating elements and effect on work of other sections.

1.5 COORDINATION OF SPACE

A. Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance and for repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.6 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and cleanup of work of separate sections in preparation for substantial completion of portions of work designated for Owner partial occupancy.

B. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with contract documents, to minimize disruption of Owner's activities.

C. Assemble and coordinate closeout submittals specified in SECTION 01 77 00 - CLOSEOUT PROCEDURES.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Scheduling and administration of progress meetings.
2. Pre-installation conferences.

B. Related Requirements:
1. Section 01 31 00 - Project Management and Coordination.
2. Section 01 31 20 - Preconstruction Meetings: Owner's preconstruction conference and pre-mobilization conference.
3. Section 01 32 16 - Construction Progress Schedules.
4. Section 01 33 23 - Shop Drawings, Product Data and Samples.
5. Section 01 45 00 - Quality Control.
6. Section 01 78 23 - Operation and Maintenance Data.
7. Section 01 78 39 - Project Record Documents.

1.2 PROGRESS MEETINGS

A. The Architect will schedule and administer monthly construction progress meetings, throughout progress of work. He will prepare agenda and distribute notice of each meeting to participants

B. Contractor shall make physical arrangements.

C. Architect will preside at meetings.

D. Location of Meetings: Contractor's field office.

E. Attendance: Contractor, job superintendent, and Architect. Owner and professional consultants will attend as appropriate. Subcontractors and suppliers shall attend as Architect sees necessary to agenda.

F. Anticipated Agenda:
1. Review of Contractor's updated Construction Schedule.
2. Review of work in-progress.
3. Field observations, problems and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

1.3 PRE-INSTALLATION CONFERENCES

A. When required in individual specification section, convene a pre-installation conference at work site prior to commencing work of the section.

B. Require attendance of entities directly affecting, or affected by, work of the section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda, preside at conference, record minutes and distribute copies within two days after conference to participants, with two copies to Architect.

E. Review conditions of installation, preparation and installation procedures and coordination with related work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 31 19.13

PRECONSTRUCTION MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Contractor participation in preconstruction meetings.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Administrative provisions.
2. Section 01 31 00 - Project Management and Coordination.
3. Section 01 31 19 - Project Meetings.

1.2 PRECONSTRUCTION MEETING

A. Architect will schedule meeting within 15 days after notice of award.

B. Attendance: Owner, Architect, General Contractor and representatives of major subcontractors.

C. Agenda
1. Submittal of executed bonds and insurance certificates.
2. Execution of Owner-Contractor Agreement.
3. Distribution of Contract Documents.
4. Submittal of list of subcontractors, list of products, schedule of values and progress schedule.
5. Designation of responsible personnel.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, change orders, allowances and Contract closeout procedures.
7. Scheduling.
8. Use of premises by Owner and Contractor.
9. Owner's requirements and occupancy.
10. Temporary facilities.
11. Survey and building layout.
12. Security and housekeeping procedures.
13. Procedures for testing.
14. Procedures for maintaining record documents.
15. Requirements for startup of equipment.
16. Accessibility Issues.
17. Inspection and acceptance of equipment put into service during construction period.
18. Notice to proceed.
19. Color samples.
20. Procedures for site meetings.
21. Site access and security.
22. Procedures and processing of TEA “Certification of Project Compliance” form.
23. Substantial and final project completion procedures.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Procedures for preparation and submittal of digital construction progress schedules and periodical updating.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Work sequence.
2. Section 01 21 00 - Allowances.
3. Section 01 33 23 - Shop Drawings, Product Data and Samples.
4. Section 01 29 00 - Payment Procedures: Schedule of Values.

1.2 SUBMITTALS

A. Within 21 days of the contract date, Contractor shall prepare and submit a digital Critical Path construction schedule for the work. After review, resubmit required revised data within 5 days.

B. Submit revised digital Critical Path Construction Schedule monthly with each Application for Payment.

C. Submit under transmittal letter specified in SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1.3 WORK SCHEDULE FORMAT

A. The schedule shall not exceed time limits current under the Contract Documents and shall be subject to the approval of the Architect. The Contractor shall prosecute the work vigorously and make every effort to start and complete each phase of the work on or before the dates stated.

B. Should actual construction of project vary from the Critical Path schedule, Contractor shall take whatever actions are necessary to improve progress as quickly as possible in order to meet pre-determined milestones. Revise and re-submit schedule not less than every 30 calendar days. Presentation of the existing or updated Critical Path schedule, in three copies, along with the Certificate of Payment Request shall be a prerequisite to the monthly review of the payment request by the Architect's representative.

C. Sequence of Listings: The chronological order of the start of each item of work.

D. Scale and Spacing: To provide space for notations and revisions.

E. Sheet Size: Minimum 11" x 17".

1.4 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by major specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of work identified in SECTION 01 11 00 - SUMMARY OF WORK.

E. Provide sub-schedules to define critical portions of entire schedule.

F. Show accumulated percentage of completion of each item, and total percentage of work completed, as of the first day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data and samples, including Owner furnished products and products specified under Allowances, and dates reviewed submittals will be required from Architect. Show decision dates for selection of finishes.

H. Show delivery dates for Owner furnished products and products specified under Allowances.

I. Coordinate content with SECTION 01 29 00 - PAYMENT PROCEDURES, Schedule of Values.

1.5 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays and impact on Schedule. Report corrective action taken, or proposed and its effect.

1.6 DISTRIBUTION

A. Distribute copies of reviewed schedules to job site file, subcontractors, suppliers and other concerned entities.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Digital submission of shop drawings.

B. Related Requirements:
1. General Conditions of the Contract for Construction: Definitions and basic responsibilities of entities.
2. Section 01 31 00 - Project Management and Coordination: Coordination of submittals.
3. Section 01 32 16 - Construction Progress Schedules: Schedules for submittals.
4. Section 01 45 00 - Quality Control: Mockups and samples for testing.
5. Section 01 50 00 - Temporary Facilities and Controls: Project management software.
6. Section 01 62 00 - Product Options.
7. Section 01 78 23 - Operation and Maintenance Data.
8. Section 01 78 39 - Project Record Documents.

1.2 GENERAL

A. Refer to General Conditions, Paragraph 3.12 (Shop Drawings, Product Data and Samples).

B. Digital Submittals: Submit to the Architect, or applicable consultant, shop drawings, product data, and samples required by specification sections. Do not submit illegible fax copies nor carbon copies of shop drawings and product data.
1. Submit using the Architect's web-based project management program (Projectmates). Prepare submittals as .pdf files, with a single file for each submittal, and upload to the Architect's project management program (Projectmates). Enter required data in program to fully identify submittal in accordance with the required submittal numbering format.

C. Within 30 days of the contract date Contractor shall prepare and submit with the Schedule of Values a comprehensive list of shop drawings, product data and samples. This list shall include products which are proposed for substitution. Also include the estimated date of each submittal and anticipated date of submittal return. Allow the Architect reasonable time to review submittals..
1. The list shall be compiled and submitted using the "Submittal" feature in the Architect's project management program (Projectmates).

D. Prepare list on basis of each specification section.

E. For products specified under reference standards, include with listing of each product:
1. Name and address of manufacturer.
2. Trade name.
3. Model or catalog designation.
4. Manufacturer's data, including performance and test data, reference standards.

1.3 SHOP DRAWINGS

A. Prepared by a qualified detailer. Prepare project-specific information, drawn accurately to scale. Do not base shop drawings on reproductions of the contract documents or standard printed data. Include supplier's / detailer's / manufacturer's title block.

B. Identify details by reference to sheet and detail numbers shown on Contract Documents.

C. Present in a clear and thorough manner original drawings which illustrate the portion of the work showing fabrication, layout, setting, or erection details, prepared by a qualified detailer. Title each drawing with Project and Contract name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

1.4 PRODUCT DATA

A. Manufacturer's standard schematic drawings and diagrams:
   1. Modify drawings to delete information which is not applicable to the work.
   2. Supplement standard information to provide additional information specifically applicable to the work.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
   1. Clearly mark each copy to identify pertinent materials, products or models.
   2. Show dimensions and clearances required.
   3. Show performance characteristics and capacities.
   4. Show wiring or piping diagrams and controls.

C. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to specification section and Article number. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

1.5 SAMPLES

A. Office samples shall be of sufficient size and quantity to clearly illustrate:
   1. Functional characteristics of product or material, with integrally related parts and attachment devices.
   2. Full range of color samples.

B. Color Selections & Samples: Provide two (2) samples for the Architect’s review and record. Provide cut sheet when applicable.
   1. Samples for Initial Selection: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Architect will return submittal with options selected. In addition to the physical samples required above, submit a .pdf file of photographs of the actual color samples and identifying labels.
   2. Samples for Verification: Submit two (2) full-size units or Sample of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection. In addition to the physical samples required above, submit a .pdf file of photographs of the actual color samples and identifying labels. Architect will retain physical samples.
      a. After Color Board has been delivered to the project site, submit one (1) sample for verification in lieu of two (2). One will be retained by Contractor for mounting on Color Board after approval by Architect.

C. Field Samples and Mock-ups:
   1. Erect at project site at location acceptable to Architect.
   2. Construct each sample or mock-up complete, including work of all trades required in finish work.
   3. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.

D. Digital Samples: In addition to the physical Office Samples and Field Samples/Mock-ups, submit a .pdf file of photographs of the actual samples/mock-ups.

E. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns, for Architect selection.

F. Submit samples to illustrate functional characteristics of products, including parts and attachments.

G. Approved samples which may be used in the work are indicated in the specification section.

H. Label each sample with identification required for transmittal letter.

1.6 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, quantities and details, manufacturer's catalog numbers and conformance of submittal with requirements of Contract Documents.

B. Coordinate submittals with requirements of work and of Contract Documents.

C. Sign or initial in a rubber-stamped review block format, each sheet of shop drawings and product data and each sample label to certify compliance with requirements of Contract Documents. Notify Architect in writing at time of submittal, of any deviations from requirements of Contract Documents.

D. Do not fabricate products or begin work which requires submittals until return of submittal with Architect acceptance.

E. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review of submittals.

F. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by Architect's review of submittals, unless Architect gives specific written acceptance of deviations. Architect will review submittals for general conformance to design intent only.

1.7 SUBMISSION REQUIREMENTS

A. Submit Shop Drawings and Product Data as soon as practicable after award of contract but not later than 30 calendar days before dates reviewed submittals will be needed.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Resubmittal Review: Allow 10 working days for review of each resubmittal.

C. Submit all office samples as soon as practicable but not later than **60 or 20** days after award of contract in order to facilitate color selections and coordination of the various materials. Final color selections and release of shop drawings contingent upon color selection will not be made until all office samples have been submitted, coordinated and approved.
   1. Color Board shall be delivered to the project site after 60 days. Contractor is responsible for updating color board with samples submitted by Contractor and approved by Architect after 60 days.

D. Digital Submittals: Submit to the Architect, or applicable consultant, shop drawings, product data, and samples required by specification sections. Do not submit illegible fax copies nor carbon copies of shop drawings and product data.
   1. The submittals shall be logged in by the General Contractor and tracked using the “Submittal” feature in the Architect’s project management program (Projectmates). All submittals shall be submitted in .pdf format.
      a. Submittals 8-1/2" x 11" and/or 11" x 17" and greater than 50 pages: Provide digital copy for the Architect’s records.
      b. Large Format Drawings (larger than 11 x 17): Provide digital copy for the Architect’s records.
   2. Architect will indicate, via markup on each digital submittal, the appropriate action, then return submittal via the Architect’s project management program (Projectmates).
   3. Submittals to be reviewed by consultants shall be submitted directly to the applicable consultant via ProjectMates with a copy simultaneously sent to the Architect. Submittals will be reviewed by the consultant and then delivered/transmitted to the Architect for his review prior to transmitting them to the contractor. Submittals to be reviewed by the testing lab shall be handled in the same manner.
   4. Color Selections & Samples: Reference “Samples” Article within this specification section.
   5. Submittals to be reviewed by consultants shall be submitted directly to the applicable consultant with a copy of only the digital transmittal simultaneously copied to the Architect. Submittals will be reviewed by the consultant and then delivered/transmitted to the Architect for his review prior to transmitting them to the contractor. Submittals to be reviewed by the testing lab shall be handled in the same manner.

E. Reference SHOP DRAWINGS Paragraph, PRODUCT DATA Paragraph, and SAMPLES Paragraph within this specification section for submittal quantity requirements.

F. Contractor is responsible for the costs associated with the digital delivery of all submittals, and hard copy where required, to the Architect and the Architect's consultants and retrieval of all submittals from the Architect, when necessary.

G. Accompany submittals with transmittal letter containing:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Identification of specification section and submittal numbers.
5. The number of each shop drawing, product data and sample submitted.
6. Notification of deviations from contract documents.
7. Other pertinent data.

H. Submittals shall include:
1. Date and revision dates.
2. Project title and number.
3. Names of Architect, Contractor, subcontractor, supplier and manufacturer.
4. Identification of product or material and specification section number.
5. Relation to adjacent structure, materials or other critical features.
6. Field dimensions, clearly identified as such.
7. Applicable reference standards.
8. A blank space 3" x 4" for Architect's stamp.
9. Identification of deviations from contract documents.
10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, compliance with contract documents and coordination with requirements of the work. Note: Absence of the Contractor's stamp shall constitute grounds for rejection of the submittal until such time as the submittal has been processed in accordance with this requirement.
11. Other pertinent data required by specifications.

1.8 RE-SUBMISSION REQUIREMENTS

A. Re-submission: For shop drawings and product data not approved by Architect, make corrections and changes in submittals required by Architect and re-submit until approved.
1. The digital re-submission shall be logged in using the “Resubmit” feature in the Architect’s project management program (Projectmates).

B. Shop Drawings:
1. Revise initial drawings and re-submit as specified for initial submittal.
2. Indicate on drawings any changes which have been made, other than those requested by Architect.

C. Product Data and Samples: Submit new data and samples as specified for initial submittal

1.9 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute reviewed copies of shop drawings and product data which carry Architect's stamp as follows: Contractor's file, project site file, record documents file, other prime contractors.

B. Keep and maintain a full set of submittals throughout the construction phase to be submitted to the Architect with other Close-out documents for delivery to the Owner for his permanent record. Set of submittals shall be delivered to the Architect in cardboard file boxes with string and button type closures. Organize submittals by CSI divisions, utilizing neatly labeled pressboard dividers to separate the sections. Neatly label short end of box with project name, contents and duration of construction.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 CODES

A. Where references are made on drawings or specifications to codes, they shall be considered an integral part of the contract documents as minimum standards. Nothing contained in the contract documents shall be so construed as to be in conflict with any law, bylaw or regulation of the municipal, state, federal or other authorities having jurisdiction.

B. Perform work in compliance with all City of Fort Worth ordinances and requirements.

1.2 GOVERNING LAWS

A. Additional information with legal implications regarding applicable governing laws and jurisdictions can be found in the conditions of the contract.

1.3 PERMITTING

A. Contractor shall, without additional expense to Owner, obtain necessary licenses and permits, and be responsible for complying with any federal, state, county and municipal laws, codes and regulations applicable to the performance of the work, including, but not limited to, any laws or regulations requiring the use of licensed contractors to perform parts of the work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the contract documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the contract documents to the extent referenced. Such standards are made a part of the contract documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the contract documents.

C. Copies of Standards: Each entity engaged in construction on project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the contract documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	800.872.2253 202.272.0080
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterway Experiment Station http://www.erdc.usace.army.mil/	601.634.2355
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257
	Available from General Services Administration www.gsa.gov	202.501.1021
	Available from National Institute of Building Sciences www.nibs.org	202.289.7800
ICC-ES	ICC Evaluation Services, Inc. www.icc-es.org	800.423.6587 562.699.0543
MIL	See MILSPEC	
MIL-STD	See MILSPEC	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257

TAS	Texas Accessibility Standards P.O. Box 12157 Austin, TX 78711 www.license.state.tx.us/ab/abtas.htm	512.463.3211

1.2 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	703.358.2960
AAMA	American Architectural Manufacturers Association www.aamanet.org	847.303.5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	202.624.5800
ACI	ACI International (American Concrete Institute) www.aci-int.org (www.concrete.org)	248.848.3700
AGA	American Gas Association www.aga.org	202.824.7000
AISC	American Institute of Steel Construction www.aisc.org	800.644.2400 312.670.2400
AISI	American Iron and Steel Institute www.steel.org	202.452.7100
ANSI	American National Standards Institute www.ansi.org	202.293.8020
APA	APA-The Engineered Wood Association www.apawood.org	253.565.6600
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers www.ashrae.org	404.636.8400
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	610.832.9585
AWPA	American Wood Protection Association www.awpa.com	205.733.4077
AWS	American Welding Society www.aws.org	800.443.9353 305.443.9353
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	212.297.2122
BIA	Brick Industry Association (The) www.gobrick.com	703.620.0010

CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	630.584.1919
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	301.596.2583
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	847.517.1200
DHI	Door and Hardware Institute www.dhi.org	703.222.2010
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	401.275.3000
GA	Gypsum Association www.gypsum.org	301.277.8686
GANA	Glass Association of North America www.glasswebsite.com	785.271.0208
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	703.435.2900
IGCC	Insulating Glass Certification Council www.igcc.org	315.646.2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	613.233.1510
MBMA	Metal Building Manufacturers Association www.mbma.com	216.241.7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	888.480.9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	312.644.6610
MIA	Marble Institute of America www.marble-institute.com	440.250.9222
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	630.942.6591
NCMA	National Concrete Masonry Association www.ncma.org	703.713.1900
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	207.829.6901
NEMA	National Electrical Manufacturers Association www.nema.org	703.841.3200

NFPA	NFPA (National Fire Protection Association) www.nfpa.org	800.344-3555 617.770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	301.589.1776
NHLA	National Hardwood Lumber Association www.nhla.com	800.933.0318 901.377.1818
NLGA	National Lumber Grades Authority www.nlga.org	604.524.2393
NOFMA	National Oak Flooring Manufacturers Association (The Wood Flooring Manufacturers Association) www.nofma.org	901.526.5016
NRCA	National Roofing Contractors Association www.nrca.net	800.323.9545 847.299.9070
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	800.323.9736 540.751.0930
NWWDA	National Wood Window and Door Association (See WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	312.786.0300
PDCA	Painting and Decorating Contractors of America www.pdca.org	800.332.7322 314.514.7322
SDI	Steel Deck Institute www.sdi.org	847.458.4647
SDI	Steel Door Institute www.steeldoor.org	440.899.0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	516.294.5424
SGCC	Safety Glazing Certification Council www.sgcc.org	315.646.2234
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	843.626.1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	703.803.2980
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	850.434.2611
TCNA	Tile Council of America, Inc. www.tileusa.com	864.646.8453
TPI	Truss Plate Institute, Inc. www.tpinst.org	703.683.1010

UL	Underwriters Laboratories Inc. www.ul.com	800.285.4476 847.272.8800
USGBC	U.S. Green Building Council www.usgbc.org	800.795.1747 202.828.7422
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	800.283.1486 503.639.0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWA - National Wood Window and Door Association) www.wdma.com	800.223.2301 312.321.6802
WI	Woodwork Institute (Formerly AWI - Architectural Woodwork Institute) www.woodworkinstitute.com	916.372.9943
WWPA	Western Wood Products Association www.wwpa.org	503.224.3930

B. Code Agencies: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

BOCA	BOCA International, Inc. (See ICC)	
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	909.472.4100
ICBO	International Conference of Building Officials (See ICC)	
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	888.422.7233 703.931.4533
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

C. Federal Government Agencies: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	800.638.2772 301.504.6816
EPA	Environmental Protection Agency www.epa.gov	202.272.0167

OSHA	Occupational Safety & Health Administration www.osha.gov	800.321.6742 202.693.1999

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 42 16

DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. “Furnish": Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. "Install": Operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

C. "Product": Materials, systems and equipment.

D. “Project Manual”: Volume assembled for the Work which may include the bidding requirements, sample forms, conditions of the contract, and specifications.

E. "Provide": Furnish and install, complete and ready for the intended use.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Quality control of products and workmanship.
2. Manufacturer's instructions.
3. Manufacturer's certificates and field services.
4. Mockups.

B. Related Requirements:
1. Section 01 33 23 - Shop Drawings, Product Data, and Samples: Field samples. Submittal of manufacturer's instructions.
2. Section 01 42 00 - References.
3. Section 01 45 23 - Testing and Inspection Services.
4. Section 01 62 00 - Product Options.
5. Individual Specifications Sections: Mockups required.

1.2 DESCRIPTION

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, and site conditions, to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Provide suitably qualified personnel to produce work of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Provide finishes to match approved samples.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Require compliance with instructions in full detail, including each step in sequence.

B. Should instruction conflict with contract documents, request clarification from Architect/Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specifications section, submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specifications section, have manufacturer or his authorized representative provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment test, adjust, and balance of equipment as applicable, and to make written report of observations and recommendations to Architect.

B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Architect/Engineer for review.

1.7 MOCKUPS

A. Tests will be performed under provisions of SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. Assemble and erect complete, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Acceptable mockups in place may be retained in completed work.

1.8 FIELD SAMPLES

A. Install field samples at the site as required by individual specification sections for review.

B. Acceptable samples represent a quality level for the work.

C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Architect/Engineer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTION SERVICES (BY OWNER)

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included: Owner provided materials testing laboratory services.

B. Related Requirements:
1. Document 00 31 32 - Geotechnical Data.
2. Terms and Conditions: Inspections, testing, and approvals required by public authorities.
3. Section 01 45 00 - Contract Quality Control: Manufacturer's certificates.
4. Section 01 78 39 - Project Record Documents.
5. Individual Specifications Sections: Inspections and tests required, and standards for testing.

1.2 SELECTION AND PAYMENT

A. Owner will employ services of an independent materials testing laboratory to perform specified inspection and testing and will pay for these services directly to the testing laboratory.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of contract documents. Contractor will pay all testing required by local authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Laboratory shall comply with requirements of ASTM E 329 and ASTM D 3740 and provide certifications to this effect.

B. Laboratory shall maintain a full-time registered Engineer on staff to review specific tests required by this specification.

C. Laboratory shall be authorized to operate in State in which project is located.

D. Testing equipment shall be calibrated to ensure accurate results and values in order to ensure that test results are true and valid, and at intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.4 LABORATORY RESPONSIBILITIES

A. Provide qualified personnel at site after due notice from the contractor; cooperate with Architect, Contractor, and appropriate public authorities having jurisdiction in performance of services.

B. Perform specified inspection, sampling, and testing of products in accordance with latest, up-to-date standards.

C. Ascertain compliance of materials and mixes with requirements of contract documents.

D. Promptly notify Architect, appropriate consultants, Contractor, Owner, and authority having jurisdiction of observed irregularities or non-conformance of work or products.

E. Perform additional inspections and tests required by Architect, Owner, Contractor, or authority having jurisdiction.

1.5 LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to Architect, one to applicable consultant, one to Owner, one to Contractor, and one to City. Include: Date issued, project title and number, name of inspector, date and time of sampling or inspection, weather conditions, identification of product and specifications section, location in the project, type of inspection or test, date of test, results of tests, and specific indication of conformance, or lack of such, with contract documents. When requested by Architect/Engineer, provide interpretation of test results.

1.6 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of contract documents.

B. Laboratory may not approve or accept any portion of the work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop work.

1.7 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and ensure ready access to work and to manufacturer's facilities, if requested by testing lab.

C. Provide incidental labor and facilities for access to work to be tested, to obtain and handle samples at the site, or at source of products to be tested, in order to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify laboratory of material sources and furnish lab-determined necessary quantities of representative samples of materials proposed for use which are required to be tested.

E. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services. Cancel notifications in a timely manner if items or systems are not ready for inspection as intended. Reimburse Owner for trip charges when cancellation notifications are not made in a timely fashion.

F. Advise laboratory in a timely fashion to complete required inspection and testing prior to subsequent work being performed.

G. Reimburse Owner for all subsequent re-testing of products or systems found to be defective or otherwise not in accordance with specification requirements, and for any overtime pay required as a result of any inspection requirements that may fall outside of normal job-site weekday work schedule. Remove rejected products or work and replace with products or work of specified quality.

H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and testing laboratory when the source of any material is changed after the original tests or inspections have been made.

PART 2 - PRODUCTS – Not used.

PART 3 - EXECUTION

3.1 EARTHWORK (SITE GENERAL)

A. Make necessary soil tests (Atterberg Limit Series ASTM D 4318 and ASTM D 698 Standard Proctor) to determine moisture content and density of existing subgrade. Perform necessary soil tests (Atterberg Limit Series and ASTM D 698 Standard Proctor for each type of imported fill) to determine the moisture content and to inspect and test the placement of additional fill lifts to verify that all fill materials used are in accordance with the specifications for that use. Perform one field density test (ASTM D 2922 and ASTM D 3017) per 5,000 sq. ft. of site area in the area affected on each lift prior to placement of additional fill material.

B. Imported Topsoil Tests: Testing for topsoil quality compliance shall be performed by the Testing Laboratory.

3.2 PAVING OR SPECIAL SURFACE SUBGRADE PREPARATION

A. Perform one subgrade in-place density test per 7,500 sq. ft. of subgrade, after subgrade preparation, in accordance with ASTM D 2922 and ASTM D 3017. Perform tests within 48 hours of pavement construction.

B. Pulverization tests on lime subgrade, TEX101E, Part III, at same frequency as density tests.

3.3 BUILDING SUBGRADE PREPARATION

A. Make necessary soil tests (Atterberg Limit Series and ASTM D 698 Standard Proctor for each type of fill) to determine the moisture content and density of existing subgrade and inspect and test the placement of additional fill lifts to verify that all fill materials used are in accordance with the specifications for that use. Perform one field density test (ASTM D 2922 and ASTM D 3017) for each 5,000 sq.ft. of area within the building footprint on each lift prior to placement of additional fill material.

3.4 DRILLED CONCRETE PIERS

A. The independent testing laboratory shall provide the services of their registered geotechnical engineer at the initiation of the on-site pier drilling operations to determine the appropriate bearing material into which the piers are to be founded. Written documentation of the "determination" shall be prepared and forwarded to the Owner, Architect, and Contractor.

B. Make on-site full-time inspections of the pier drilling operation for each pier drilled and placed to verify that the proper strata and penetration, or depth, has been attained, and determine that shafts are properly clean and dry before placing concrete.

C. Maintain a pier log for each pier showing design requirements and actual in place size and depth, in accordance with example noted in Specification SECTION 31 63 29 - DRILLED CONCRETE PIERS.

D. Verify that the excavation is of the proper size and adequately clean and dry.

E. Verify that each shaft is founded at a depth in accordance with the geotechnical report, existing on-site conditions that may be encountered, and at the proper bearing strata.

F. Verify that the reinforcing steel and concrete are properly placed in accordance with other testing provisions specified herein.

G. Notify the Architect and Contractor if soil or water conditions may require casing of piers.

H. Inspection reports of pier drilling shall contain the following:
1. Pier Mark.
2. Pier Depth.
3. Depth of penetration into bearing strata.
4. Plumbness deviation.
5. Description of unusual conditions encountered, including groundwater.
6. Record of deviations from contract document requirements.
7. Other requirements, as defined in SECTION 31 63 29 - DRILLED CONCRETE PIERS.

3.5 FORMWORK, REINFORCING STEEL AND INSERTS

A. Make general inspection of formwork.

B. Prior to each concrete pour, inspect fabrication and bending of bars, bar sizes, spacing, placement and tying in accordance with ACI 315.

C. Prior to each concrete pour, inspect positioning of steel inserts and assemblies, sizes, and spacing, and inspect fusion-welded anchors and sheer connectors.

3.6 CAST-IN-PLACE CONCRETE

A. Design Mixes:
   1. At the beginning of the work, Contractor shall submit proposed concrete mixes for review by the Architect, structural engineering consultant, and testing laboratory, including the sieve analysis of fine and course aggregate ASTM C 136, dry rodded weight of coarse aggregate - ASTM C 29, and the specific gravity (bulk saturated surface dry), of fine and coarse aggregates ASTM C 127 and C 128.
   2. The testing laboratory will submit their findings to the structural consultant, who will subsequently forward this information, with their review of the submittals, to the Architect.
   3. Contractor shall not mix concrete for placing in the work until confirmation laboratory reports are supplied to reflect that each proposed mix will develop the strength required. Successful past history in accordance with ACI 318 will be satisfactory.

B. Test Cylinders: Make at least one test of each day's pouring of concrete or each 100 cubic yards, whichever is the least, on each different portion or section of the work. Mold and cure specimens in accordance with ASTM C 31, and test in accordance with ASTM C 39. Test cylinders shall be made and tested by the laboratory. Footings, walls, and floor systems constitute different sections. Each test shall consist of four specimens, one of which shall be broken at seven days, two at 28 days and one held in reserve. Determine temperature and air content for each set of test cylinders in accordance with ASTM C 231.

C. Field Quality Control:
   1. Determine slump for each concrete strength test and whenever consistency of concrete varies, in accordance with ASTM C 143.
   2. Monitor and record addition of water to concrete and length of time concrete is allowed to remain in truck.
   3. Verify delivery tickets indicating class of concrete, amount of water added during initial batching, and time initial batching occurred.
   4. Monitor work being performed in accordance with ACI (American Concrete Institute) recommendations as a standard of quality.
   5. Reference SECTION 03 30 00 - CAST-IN-PLACE CONCRETE for additional requirements.

D. Source Quality Control: An independent testing laboratory representative shall periodically inspect and control concrete mixing and loading of transit mix trucks at batch plant at intervals appropriate to monitor quality of material issued on job.

3.7 MORTAR, GROUT, AND MASONRY REINFORCEMENT

A. Coordinate with Owner’s testing laboratory to provide periodic inspection of the following task:
   1. As masonry construction begins, the following shall be verified to ensure compliance:
      a. Proportions of site prepared mortar.
      b. Construction of mortar joints.
      c. Location of reinforcement and connectors.
   2. The inspection program shall verify:
      a. Size and location of structural elements.
      b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
      c. Specified size, grade, and type of reinforcement.
      d. Protection of masonry during cold weather (temperature below 40°F.) or hot weather (temperature above 90°F.).
   3. Prior to grouting, the following shall be verified to ensure compliance:
      a. Grout space is clean.
      b. Placement of reinforcement and connectors.
      c. Proportions of site-prepared grout.

d. Construction of mortar joints.

B. Coordinate with Owner's testing laboratory to provide continuous inspection of the following task:
1. Grout placement shall be verified to ensure compliance with code and construction document provisions.

3.8 STRUCTURAL STEEL

A. Fabrication of, erection of, and connections between, structural steel members, including welding and tension in high strength bolts, will be accomplished under and subject to the inspection of an independent testing agency. The general contractor, structural steel fabricator, and erector shall afford full cooperation to the laboratory.

B. Perform the following testing and inspection: (Prior to placement of steel deck)
1. Check location of condition of anchor bolts.
2. Check plumbness and tolerance of steel frame.
3. Qualification of welders and welding techniques (at Contractor's expense).
4. Visually inspect common bolts.
5. Inspection of high-strength bolting:
a. Visually inspect connections.
b. Check tightness of at least 33% of connections.
c. Check at least two bolts of each girder to column connection.
6. Visually inspect field and shop welds.
7. Ultrasonic or X-ray testing of full penetration welds.
8. Re-inspect corrective measures required at expense of Contractor.
9. Verify that no members are damaged.
10. Verify that materials and installation are according to contract documents and industry standards.

C. Gas Cutting: Do not use gas cutting torches for correcting fabrication errors in the structural framing. Cutting will not be permitted on any member, unless specifically approved by the structural engineer. Finish gas-cut sections equal to a sheared appearance when gas finish cutting is permitted. Do not flame cut holes or enlarge holes by burning.

D. Correction: The fabricator or erector shall correct deficiencies in structural steel work which inspection and test reports have indicated to be not in compliance with the specified requirements. Perform all additional tests required to reconfirm non-compliance of the original work and to show compliance of corrected work. Retesting of non-conforming work shall be paid by the Contractor.

E. All welders employed during erection of structural steel must be certified by The American Welding Society for type of base materials and positions encountered. Certification testing to be performed at Contractor's expense and copies of Certifications shall be submitted for review upon request and maintained at the project site by the Contractor.

3.9 STEEL JOISTS

A. All steel joists and connections to structural steel members shall be inspected.

B. Quality Assurance: All welding performed during the manufacture and erection of steel joists shall comply with the requirements of AWS D1.1.

C. Inspect condition of joists after erection; check method of attachment to structures and details of bridging and accessories to verify compliance with required standards.

3.10 METAL DECKING

A. Qualification of Welders: Qualify the welding process and all welders (at Contractor expense), and periodically monitor the work in accordance with the requirements of AWS D1.3.

B. Testing Laboratory shall inspect steel decking to ensure the material and installation is in accordance with the specifications and shop drawings.

3.11 METAL DECK AND FIELD WELDED SHEAR STUDS:

A. The erection of metal deck and field welded shear studs shall be subject to inspection by the testing agency.

B. Shear Studs:
   1. Test minimum of two shear studs welded at start of each production period in order to determine generator, control unit and stud welder setting. Studs shall be capable of being bent 45° from vertical without weld failure. If, after welding, visual inspection reveals that sound weld or a full 360° fillet has not been attained for a particular stud, such stud shall be struck with hammer and bent 15° off perpendicular to nearest end of beam. Studs failing under this test shall be replaced.
   2. When the temperature is below 32°F., two studs from each group of 100 studs (or one stud if less than 100 studs are present) should be tested after cooling. Studs shall not be welded below 0°F. or when surfaces are wet with rain or snow. If stud fails in weld, two new studs shall pass test before resumption of welding.

3.12 SMOKE TEST OF DRAINAGE AND VENT PIPING

A. Test to check for joint leakage in the sanitary sewer system and vent system.

3.13 OTHER WORK REQUIRING TESTS

A. Refer to individual sections covered under Divisions 22, 23, and 26 for other work requiring tests by independent testing laboratory.

B. Other Tests:
   1. Moisture content in face brick.
   2. Camera TV Video Recording of all main Storm Drain and Sanitary Sewers in and under the Building (By General Contractor). Plumbing contractor to coordinate with the General Contractor’s Third Party testing firm.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 GENERAL

A. Provide temporary facilities and controls needed for the work including, but not limited to those described in the Articles below.

B. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.

1.2 ACCESS

A. Provide and maintain access to fire hydrants, free of obstructions.

1.3 FIELD OFFICE

A. Maintain temporary field office within an existing building as designated by the Owner. Equip with adequate illumination; with smooth tables for perusal of drawings and specifications; and with metal legal size four-drawer filing cabinet. In addition to the above listed equipment, provide a space to accommodate the site meetings and have a layout/conference table at 28" height and chairs for 12 people. Upon completion of the project, remove offices from the premises.

1.4 TELEPHONES AND ELECTRONIC COMMUNICATION SERVICE

A. Provide telephones/mobile phones in the field office. Telephone shall be in operation from the commencement of work until the acceptance of the building. Contractor shall pay for installation, maintenance, and removal of telephone and for all use charges.

B. Electronic Communication Service: Provide a computer, printer, high-speed data connection, and internet service as required for the Contractor to maintain internet access and e-mail correspondence.
   1. The Architect's project management system is Projectmates by Systemates, which can be accessed by logging in at the following website: www.vlkprojects.com. Contractor shall utilize this system for all formal and informal correspondence with the Architect and Architect's Consultants, including E-Mails, Requests for Information, Proposals, Submittals, Submittal Transmittals, Meeting Minutes (for regularly scheduled meetings), and Warranty Responses (if warranty items are submitted in the system). In addition, Subcontractor Lists, Project Schedules, Schedule of Values and other documents requiring submission shall be uploaded in pdf, Word, or Excel format by the Contractor to the appropriate location in Projectmates. At the Contractor's option, Pay Applications, Project Schedules, and Transmittals, may be created or imported into the system, as well.
   2. While the project management system is very user friendly and easy to learn, Architect will provide informal training for the Contractor as necessary to expedite the Contractor's familiarity with the program.
   3. Contractor shall pay for installation, maintenance, and removal of high-speed data connection and for all use charges**.**

1.5 TEMPORARY ELECTRICAL SERVICE

A. At all locations, utilize building electrical power to the extent existing power may be suitable for construction operations. Make all tie-ins and maintain utility service in all occupied areas. Damage, if any, caused by the Contractor use or tie-ins shall be immediately corrected by the Contractor to as-new conditions. Owner shall pay only the energy charges.
   1. Provide GFCI adapters since existing circuits may not be protected.

B. Provide and maintain electrical power to points in the building convenient for and available to all trades, including mechanical and other subcontractors, so that power may be secured anywhere in the building with no more than a 100 ft. extension cord. Energy charges for power taken from existing building electrical system shall be paid by the Owner.

1.6 TEMPORARY LIGHTING

A. Provide and maintain temporary lighting inside the building for safe and adequate working conditions throughout all areas where work of any kind is being performed. Provide at least 1/2 watt of incandescent lighting for each square foot of space. Where practical, place temporary lights in the locations where the permanent lighting fixtures are to be installed.

1.7 TEMPORARY HEAT

A. Provide necessary heat during the course of construction, including equipment, fuel and attendance where required. Equipment for temporary heating shall be of a non-smudging type. The permanent heating system may be used for temporary heat, when installed. Upon completion and before acceptance of the building, Contractor shall repair all damage caused by such temporary use and shall clean all filters.

B. When the outside temperature is below freezing, inside of the building shall be kept at or above 40°F. at all times. While painting and finishing are in progress, the temperature shall be kept at or above 60°F. Contractor shall make good all damage caused by insufficient heat.

1.8 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.9 TEMPORARY WATER SERVICE

A. Provide and maintain a temporary water supply during the course of construction and pay meter installation or "tap" fee, if any. Include necessary piping and hose connections. Take precautions to avoid spattering and spilling water in the building. Monthly water usage will be paid by the Owner.

1.10 TEMPORARY SANITARY FACILITIES

A. Owner will designate existing toilets for use. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness within designated restrooms.

1.11 REFUSE

A. The Contractor shall provide refuse removal service at all times.

1.12 PROTECTIVE FACILITIES

A. Provide and maintain temporary guardrails, handrails and covers for floor, roof and wall openings, vertical shafts and stairways. If movement of the protective facilities is required by a subcontractor to perform his work, it will be the responsibility of that subcontractor to give prior notification to the Contractor and to replace the protective facilities in a satisfactory manner.

B. Provide and maintain, as per City of Fort Worth requirements, fire lane(s) and other required fire protection at the appropriate time and sequence of construction.

1.13 BARRICADES

A. Provide and maintain lighted barricades and fences for the public protection in accordance with requirements of the local city ordinances.

1.14 TEMPORARY FIRE PROTECTION

A. Contractor shall provide adequate fire extinguishers on the premises during the course of construction, of the type and size recommended to control fires, which may result from the particular work being performed in accordance with the local fire marshal and fire codes.

B. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition for possible fires.
   1. Keep work area free of combustible material.
   2. A fire watch consisting of at least one man furnished by Contractor with a fire extinguisher in hand and with no other assigned duties, shall be posted to stand by and observe for potential hazards while welding or cutting is being done. Equip fire watch with suitable personal eye protection and fire extinguishers.
   3. At completion of work operations, immediately inspect work and adjacent area for hazards. Re-inspect work for hazards at 1/2 hour and at one hour after completion of welding and cutting operations.

C. No smoking shall be allowed within the building or on the site. Post NO SMOKING signs in areas where work is in progress.

1.15 ENCLOSURES

A. Provide temporary weathertight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to prevent damage to existing areas and equipment. Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; STC rating 35 in accordance with ASTM E 90; flame spread rating of 25 in accordance with ASTM E 84; paint surfaces exposed to view in Owner occupied areas.

1.16 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment.

B. Protect site from puddling or running water.

1.17 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off site.

B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

C. Refer to SECTION 01 74 13 - PROGRESS CLEANING for additional cleaning requirements.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary materials, equipment, services, and construction prior to substantial completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2'; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

1.19 PROJECT IDENTIFICATION SIGNS

A. Furnish and erect a project sign, approximately 4' high by 8' long of 3/4" thick exterior grade plywood, in conformance with sign detail supplied by the Architect. Support on posts of framing of treated wood or steel.

B. Erect sign within 30 days of start of construction and maintain in good condition until completion of project. Sign shall be located as directed by the Architect.

C. No other signs or advertising of any kind, except precautionary warning signs, will be permitted.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 57 23

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Storm Water Pollution Prevention and Pollution Control Plan as required by the Texas Commission on Environmental Quality (TCEQ), effective March 2018.

B. Related Sections:
1. Section 31 00 00 - Earthwork

1.02 QUALITY ASSURANCE

B. State Standards: Execution of the Pollution Prevention and the Pollution Control Plan shall meet all requirements set forth by TCEQ under the Texas Pollution Discharge Elimination System (TPDES) regulations.

PART 2 - PRODUCTS

NOT APPLICABLE.

PART 3 - EXECUTION

3.01 PERFORMANCE

A. General: Implement all the requirements detailed in the Erosion Control Plan and any additional pollution prevention and control measures required by the TCEQ.

B. The Erosion Control Plan is included as part of the construction plans. The erosion control measures shown on the plans are the minimum required for this project. The contractor shall implement additional erosion control devices as construction sequence and activities dictate.

C. The SWPPP document (including N.O.I. and N.O.T.) that makes up the balance of the SWPPP shall be prepared by the contractor at his expense. The contractor shall be the Owner/Operator of the SWPPP and responsible for executing and filing the N.O.I. and N.O.T. and paying all fees required by TCEQ.

END OF SECTION

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for product options and substitutions.

B. Related Requirements:
1. Section 01 31 00 - Project Management and Coordination: Coordination of construction.
2. Section 01 33 23 - Shop Drawings, Product Data, and Samples: Product data submittals.
3. Section 01 42 00 - References: Applicability of specified reference standards.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Section 01 78 39 - Project Record Documents.

1.2 PRODUCT LIST

A. Within 30 days after date of contract, submit to the Architect a list of products and materials which are proposed for substitution per SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

B. For products specified by naming several products or manufacturers, followed by the words "NO SUBSTITUTIONS", select one of the products/manufacturers named.

C. For products specified by naming only one product and manufacturer, there is no option unless a substitution is approved as specified below.

D. For products specified by naming only one product and manufacturer, followed by the words "NO SUBSTITUTIONS", there is no option.

1.4 SUBSTITUTIONS

A. Requests for substitution to material, products, or equipment instead of those specified will be considered if received at least 10 days prior to the bid date. Substitution request received within 10 days of the bid date will be returned without review. Refer to Substitution Request (During the Bidding Phase) form attached to this section.

B. Within 30 days after Notice to Proceed, Architect will consider additional formal requests from the Contractor for substitutions of products in place of those specified. Refer to Substitution Request (After the Bidding Phase) form attached to this section.

C. Submit a separate request for each substitution on a copy of the "SUBSTITUTION REQUEST" form, attached to this section. Include in request:
1. Complete data substantiating compliance of proposed substitution with contract documents.
2. For products:
   a. Product identification, including manufacturer's name and address.
   b. Manufacturer's literature, including product description, performance and test data and reference standards.
   c. Samples, if applicable.
   d. Name and address of similar projects on which product was used and date of installation.
3. For construction methods:
   a. Detailed written descriptions of proposed method.
   b. Complete drawings illustrating methods or revisions.
4. Itemized Comparison of qualities of proposed substitution with product or method specified.
5. Changes required in other elements of work because of substitution.
6. Effect on construction schedule.

D. Request for substitution constitutes a representation that Contractor:
   1. Has personally investigated proposed product or method and determined that it is equal to or superior in all respects to that specified.
   2. Will provide same warranties for substitution as for product or method specified.
   3. Will coordinate installation of accepted substitution into the work, making such changes as may be required for the work to be complete in all respects.
   4. Waives all claims for additional cost, under his responsibility and related to substitution, which subsequently become apparent.

E. Substitutions will not be considered if:
   1. They are indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this section.
   2. Acceptance will require substantial revision of contract documents.

F. If substitution is not approved or accepted, Contractor shall furnish specified product or method at no additional cost to the Owner.

G. Acceptance of a proposed substitution prior to the bid date will be in the form of an addendum.

1.5 SUBMITTAL PROCEDURES

A. Submit five copies of request for substitution.

B. Architect will review Contractor's requests for substitutions with reasonable promptness.

C. For accepted products, submit shop drawings, product data, and samples under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SUBSTITUTION REQUEST
(During the Bidding Phase)
(submit two copies-must be received 10 days prior to bid/proposal date)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, custom color/pre-selected color availability, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E/ design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E REVIEW AND ACTION

☐ Substitution approved - Submit bid/proposal based on accepted substitution.

☐ Substitution approved as noted - Submit bid/proposal based on accepted substitution - as noted.

☐ Substitution rejected - Submit bid/proposal for specified materials.

☐ Substitution Request received too late - Submit bid/proposal for specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐_____

SUBSTITUTION REQUEST
(After the Bidding Phase)
(submit five copies - must be received not later than 30 days after Notice to Proceed)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section No.: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

For finish materials and pre-finished equipment, list the colors available for the specified item and the colors available for the proposed substitution.

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST - Continued

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Section 01 33 23.

☐ Substitution approved as noted - Make submittals in accordance with Section 01 33 23.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐_____

_____

_____

_____

_____

-- THIS PAGE INTENTIONALLY BLANK --

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included:
1. Packaging, Transportation.
2. Delivery and Receiving.
3. Product Handling.

B. Related Requirements:
1. Section 01 32 16 - Construction Progress Schedules.
2. Section 01 33 23 - Shop Drawings, Product Data and Samples: Manufacturers' Instructions.
3. Section 01 66 00 - Product Storage and Handling Requirements.
4. Individual Sections: Specific requirements for packaging, shipping and handling.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PACKAGING, TRANSPORTATION

A. Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture.

B. Protect sensitive equipment and finishes against impact, abrasion and other damage.

3.2 DELIVERY AND RECEIVING

A. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at site; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.

C. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

D. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

E. Immediately on delivery, inspect shipment to assure
1. Product complies with requirements of contract documents and reviewed submittals.
2. Quantities are correct.
3. Accessories and installation hardware are correct.
4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

3.3 PRODUCT HANDLING

A. Provide equipment and personnel to handle products by methods to prevent soiling and damage.

B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

C. Handle product by methods to avoid bending or over-stressing. Lift large and heavy components only at designated lift points.

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included:
1. Storage, General.
2. Enclosed Storage.
3. Exterior Storage.
4. Maintenance of Storage.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work.
2. Section 01 50 00 - Construction Facilities and Temporary Controls: Storage facilities. Protection of installed work.
3. Section 01 65 00 - Product Delivery Requirements.
4. Section 01 78 39 - Project Record Documents.

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION

3.1 STORAGE, GENERAL

A. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

3.2 ENCLOSED STORAGE

A. Store products, subject to damage by the elements, in substantial weathertight enclosures.

B. Maintain temperature and humidity within ranges stated in manufacturer's instructions.

C. Provide humidity control and ventilation for sensitive products as required by manufacturer's instructions.

D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3.3 EXTERIOR STORAGE

A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

D. Provide surface drainage to prevent erosion and ponding of water.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.4 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on a scheduled basis.

B. Verify that storage facilities comply with manufacturer's product storage requirements.

C. Verify that manufacturer required environmental conditions are maintained continually.

D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of contract documents.

3.5 MAINTENANCE OF EQUIPMENT STORAGE

A. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.

B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a record document.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements and limitations for cutting and patching of work.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Work by Owner or by separate contractors.
2. Section 01 62 00 - Product Options.
3. Individual Specifications Sections:
a. Cutting and patching incidental to work of the section.
b. Advance notification to other Sections of openings required in work of those sections.
c. Limitations on cutting structural members.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submit written request in advance of cutting or alteration which affects
1. Structural integrity of any element of the project.
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

C. Include in request
1. Identification of project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Description of proposed work and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

1.3 PAYMENT FOR COSTS

A. Costs resulting from ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Architect or other consultants, shall be borne by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products: Those required for original installation.

B. For any change in materials, submit request for substitution under provisions of SECTION 01 62 00 - PRODUCT OPTIONS.

PART 3 - EXECUTION

3.1 GENERAL

A. Execute cutting, fitting and patching including excavation and fill, to complete work, and to
1. Fit the several parts together, to integrate with other work.
2. Uncover work to install ill-timed work.
3. Remove and replace defective and non-conforming work.

4. Remove samples of installed work for testing.
5. Provide openings in elements of work for penetrations of mechanical and electrical work.

3.2 INSPECTION

A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.3 PREPARATION

A. Provide temporary supports to assure structural integrity of surroundings; devices and methods to protect other portions of project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

C. Maintain excavations free of water.

3.4 PERFORMANCE

A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

D. Restore work with new products in accordance with requirements of contract documents.

E. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated packing material, full thickness of the construction element.

G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 13

CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Throughout the construction period, maintain the building and site in a standard of cleanliness as described in this section.

B. Related Requirements: In addition to standards described in this section, comply with requirements for cleaning as described in other pertinent sections of these specifications.

1.2 QUALITY ASSURANCE

A. Conduct a daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General:
1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. Do not allow accumulation of scrap, debris waste material, and other items not required for construction of the work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the project site.
4. Provide adequate storage for all items awaiting removal from the project site, observing requirements for fire protection and protection of the ecology.

B. Site:
1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of this section.
3. Maintain the site in a neat and orderly condition at all times.

C. Structure:
1. Weekly, and more often if necessary, inspect the structure and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
3. As required preparatory to installation of succeeding materials, clean the structure or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed.

D. "Clean", for the purpose of this subparagraph shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.

3.2 FINAL CLEANING

A. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provide by skilled cleaners using commercial quality building maintenance equipment and materials.

B. Prior to completion of the work, remove from the project site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in this section.

C. Site:
1. Unless otherwise specifically directed by Architect, broom clean paved areas on the site and public paved areas adjacent to the site.
2. Completely remove resultant debris.

D. Structure:
1. Exterior:
a. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
b. Remove all traces of splashed materials from adjacent surfaces.
c. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
d. In event of stubborn stains not removable with water, Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
2. Interior:
a. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
b. Remove all traces of splashed material from adjacent surfaces.
c. Remove paint droppings, spots, stains, and dirt from finished surfaces.
3. Glass: Clean inside and outside.
4. Polished Surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. This does not apply to resilient flooring surfaces. Reference SECTION 09 65 00 - RESILIENT FLOORING for cleaning of resilient flooring.

E. Special floor/base final cleaning requirements:
1. Contractor shall coordinate with the Owner’s housekeeping department for preparing the surfaces for final cleaning by the Contractor and protective coatings installed by the Owner.
2. Protection after final treatment until date of Substantial Completion shall be the responsibility of the Contractor.
3. All repairs or re-application required as a result of damage caused by the Work shall be the responsibility of the Contractor as directed by the Owner.

F. Schedule final cleaning, as approved by the Architect, to enable the Owner to accept a completely clean work.

3.3 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the work, or any portion thereof, prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions of the Contract for Construction.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for project closeout, including but not limited to:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operating and maintenance data submittal, including training sessions for equipment and systems.
   4. Submittal of warranties.
   5. Submittal of spare parts and maintenance materials.

B. Related Requirements:
   1. Section 01 11 00 - Summary of Work: record drawings.
   2. Section 01 33 23 - Shop Drawings, Product Data and Samples.
   3. Section 01 74 13 - Progress Cleaning: final cleaning.
   4. Section 08 71 00 - Door Hardware: keys and keying schedule.

1.2 SUBSTANTIAL COMPLETION

A. General: Substantial Completion is defined in Paragraph 9.8.1 of the General Conditions.

B. Preliminary Procedures: Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
      a. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete construction and reasons the work is not complete.
   2. Advise Owner of pending insurance change-over requirements.
   3. Submit specific warranties, maintenance agreements, final certifications and similar documents.
   4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
   5. Submit record drawings, maintenance manuals and similar final record information.
   6. Deliver tools, spare parts, extra stock and similar items.
   7. Make final change-over of permanent locks and transmit keys and keying schedule to the Owner. Advise the Owner's personnel of change-over in security provisions.
   8. Complete start-up testing of systems, and training sessions for Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
   9. Complete final clean-up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

C. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
   1. Architect will repeat the inspection when requested and assured that the work has been substantially completed.

D. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, submit the following. List exceptions in the request.
   1. Final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Updated final statement, accounting for final additional changes to the contract sum.
3. Certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
4. Consent of surety to final payment.
5. Final Liquidated Damages settlement statement.
6. Evidence of final, continuing insurance coverage complying with insurance requirements.
7. Evidence of Compliance with Requirements of Governing Authorities
   a. Certificate of Occupancy.
   b. Certificates of Inspection required for mechanical and electrical systems.
8. Operation and Maintenance Data: Under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.
9. Warranties and Bonds: Under provisions of SECTION 01 78 30 - WARRANTIES AND BONDS.
10. Project Record Documents: Under provisions of SECTION 01 78 39 - PROJECT RECORD DOCUMENTS.
11. Spare Parts and Maintenance Materials: Under provisions of SECTION 01 78 40 - SPARE PARTS, OVERAGES AND MAINTENANCE MATERIALS.
12. Keys and Keying Schedule: Under provisions of SECTION 08 71 00 - DOOR HARDWARE.
13. Evidence of Payment and Release of Liens: In accordance with General Conditions of the Contract for Construction.
14. Evidence of Payment of Debts and Claims: In accordance with General Conditions of the Contract for Construction.
15. Certificate of Project Compliance: Required under provisions of Texas Administrative Code (TAC), Chapter 61, 1036(c)(3)(F). Form developed by the Texas Education Agency (TEA). See form attached to the end of this Section.
16. Certification of Asbestos and Lead Free Project: The Contractor shall submit to the Architect a letter addressed to the Owner certifying that no materials used in the construction of this project contain lead nor asbestos materials in excess of amounts allowed by local/state standards, laws, codes, rules and regulations, Federal Environmental Protection Agency (EPA) standards and the Federal Occupational Safety and Health Administration (OSHA) standards, whichever are most restrictive. Certification shall further state that should lead or asbestos fibers be found in this project in concentrations greater than the allowed amounts, that the Contractor shall be responsible for determining which materials contain the lead or asbestos fibers and shall take corrective action to remove those materials from the project at no additional cost to the Owner. Final payment shall not be made until this letter of certification has been received.

B. Re-inspection Procedures: Architect will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been complete, except items whose completion has been delayed because of circumstances acceptable to the Architect.
   1. Upon completion of re-inspection, the Architect will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   2. If necessary, re-inspection will be repeated.

C. Re-inspection Fees: Should status of completion of work require re-inspection by Architect due to failure of work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect and appropriate consultants compensation for re-inspection services from final payment to Contractor. The reimbursement transaction shall be executed by change order to the contract.

1.4 CLOSEOUT PROCEDURES

A. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in one set of individual heavy-duty 3-1/2", three-ring vinyl-covered binders, with identification on front and spine of each binder. Include the following types of information:
   1. Emergency instructions.
   2. Spare parts list.
   3. Copies of warranties.
   4. Wiring diagrams.
   5. Recommended "turn around" cycles.
   6. Inspection procedures.
   7. Shop drawings.
   8. Fixture lamping schedule.

B. Shop Drawings: Keep and maintain a full set of submittals throughout the construction phase to be submitted to the Architect with other close-out documents for delivery to the Owner for his permanent record. Set of submittals shall be delivered to the Architect in cardboard file boxes with string and button type closures. Organize submittals by CSI divisions, utilizing neatly labeled pressboard dividers to separate the sections. Neatly label short end of box with project name, contents and duration of construction.

C. Operating and Maintenance Training Sessions: Prepare a written agenda of items to be covered at each training session. Attendance by Owner's operating and maintenance personnel is mandatory. Notify Owner not less than 48 hours prior to scheduled training sessions.
   1. Arrange for each installer of equipment and systems that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
      a. Maintenance manuals.
      b. Record documents.
      c. Spare parts and materials.
      d. Tools.
      e. Lubricants.
      f. Fuels.
      g. Identification systems.
      h. Control sequences.
      i. Hazards.
      j. Cleaning.
      k. Warranties and bonds.
      l. Maintenance agreements and similar continuing commitments.
   2. Training sessions shall consist of not less than five days of not less than four hours each day. A copy of maintenance manuals for equipment or system being demonstrated shall be on hand during training session. As part of instruction for operating equipment, demonstrate the following procedures:
      a. Start-up.
      b. Shutdown.
      c. Emergency operations.
      d. Noise and vibration adjustments.
      e. Safety procedures.
      f. Economy and efficiency adjustments.
      g. Effective energy utilization.
   3. Training sessions shall be conducted for:
      a. Food service equipment.
      b. HVAC systems.
      c. Energy management controls.
      d. Public address system.
      e. Fire alarm and smoke detection systems.
   4. Demonstration and Training DVDs
      a. General: Engage a qualified commercial photographer to record demonstration and training DVDs. Record each training session separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids.
      b. Digital Format: Provide high-quality DVD color recording.
      c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
      d. Narration: Describe scenes by audio narration by microphone while being recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      e. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from recording opposite the corresponding narration segment.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Format and content of manuals.
2. Instruction of Owner's personnel.
3. Schedule of submittals.

B. Related Requirements:
1. Section 01 33 23 - Shop Drawings, Product Data, and Samples.
2. Section 01 45 00 - Quality Control: Manufacturer's instructions.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 30 - Warranties and Bonds.
5. Section 01 78 39 - Project Record Documents.
6. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.2 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3 FORMAT

A. Prepare data in the form of an instructional manual.

B. Binders: Bind in one set of individual heavy-duty 8-1/2" x 11" black, three-ring binders with hardback, cleanable, plastic covers; 3" maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of project identify subject matter of contents.

D. Arrange content by systems, under section numbers and sequence of table of contents of this project manual.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 20-pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of project; names, addresses, and telephone numbers of Architect/Engineer and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use project record documents as maintenance drawings.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in SECTION 01 45 00 - QUALITY CONTROL.

F. Warranties and Bonds: Bind in copy of each.

1.5 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual specifications sections.

E. Provide a listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.6 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

C. Include as-installed color coded wiring diagrams.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide as-installed control diagrams by controls manufacturer.

K. Provide Contractor's coordination drawings, with as-installed color coded piping diagrams.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: As specified in individual specifications sections.

O. Provide a listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.7 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction.

1.8 SUBMITTALS

A. Submit one copy of preliminary draft or proposed formats and outlines of contents before start of work. Architect/Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Architect/Engineer comments. Revise content of documents as required prior to final submittal.

D. Submit one copy of revised volumes of data in final form within 10 days after final inspection.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 78 30

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation and submittal of warranties and bonds.
2. Schedule of submittals.

B. Related Requirements:
1. Document 00 21 16 - Instructions to Proposers: Proposer bonds.
2. General Conditions of the Contract for Construction: Performance Bond and Labor and Material Payment Bonds, Warranty, and Correction of Work.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Section 01 78 39 - Project Record Documents.
6. Individual Specifications Sections: Warranties and bonds required for specific products or work.

1.2 FORM OF SUBMITTALS

A. Bind in one individual heavy-duty 8-1/2" x 11" black, three-ring binders, with hardback, cleanable, plastic covers.

B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of project; name, address and telephone number of Contractor; and name of responsible principal.

C. Table of Contents: Neatly typed, in the sequence of the table of contents of the project manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

D. Separate each warranty or bond with index tab sheets keyed to the table of contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.3 PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the date of substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.4 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

B. Make other submittals within 10 days after date of substantial completion, prior to final application for payment.

C. For items of work when acceptance is delayed beyond date of substantial completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Maintenance and submittal of record documents and samples.

B. Related Requirements:
1. General Conditions of the Contract for Construction: Documents at the site.
2. Section 01 33 23 - Shop Drawings, Product Data, and Samples.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
1. Contract drawings.
2. Specifications.
3. Addenda.
4. Change orders and other modifications to the contract.
5. Reviewed shop drawings, product data, and samples.
6. Field test records.
7. Inspection certificates.
8. Manufacturer's certificates.

B. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

C. Label and file record documents and samples in accordance with section number listings in table of contents of this project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.

E. Keep record documents and samples available for inspection by Architect.

1.3 RECORDING

A. Record information on a set of opaque drawings, and in a copy of a project manual. All changes made in these drawings in connection with the final construction and installation shall be neatly made in red ink on the prints.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Contractor shall include with the record documents, all changes and modifications made by addenda, change orders, supplementary instructions, or other forms of documentation, written or verbal, which alter the documents.

D. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

E. Contract drawings and shop drawings: Legibly mark each item on the drawings to record actual construction, including:
1. Measured depths of elements of foundation in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.

4. Field changes of dimension and detail.
5. Changes made by addenda and modifications.
6. Details not on original contract drawings.
7. References to related shop drawings and modifications.

F. Specifications: Legibly mark each item in the specifications to record actual construction, including:
   1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
   2. Changes made by addenda and modifications.

G. Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other documents required by individual specifications sections.

H. Maintain these documents to reflect the current conditions of the work. Changes shall be reviewed on a monthly basis with the Architect's representative. The Contractor's updating of the "installed condition drawings" shall be a prerequisite to the monthly review of the Contractor's payment request by the Architect's representative.

1.4 SUBMITTALS

A. At contract closeout, deliver record documents and samples under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.

B. Transmit with cover letter in duplicate, listing:
   1. Date.
   2. Project title and number.
   3. Contractor's name, address, and telephone number.
   4. Number and title of each record document.
   5. Signature of Contractor or authorized representative.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 78 40

SPARE PARTS, OVERAGES AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Includes:
   1. Products required.
   2. Storage and delivery of products.

B. Related Requirements:
   1. Section 01 66 00 - Product Storage and Handling Requirements.
   2. Section 01 77 00 - Closeout Procedures.
   3. Section 01 78 23 - Operation and Maintenance Data.
   4. Individual Specifications Sections: Specific spare parts and materials required.

1.2 PRODUCTS REQUIRED

A. Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual sections to be provided to Owner, in addition to that required for completion of work.

B. Products: Identical to those installed in the work. Include quantities in original purchase from manufacturer to avoid variations in manufacture.

1.3 STORAGE, MAINTENANCE

A. Store products with products to be installed in the work, under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. When adequate, secure storage facilities are available at site, capable of maintaining conditions required for storage and not required for contract work or storage, or for Owner's needs, spare products may be stored in available space.

C. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

1.4 DELIVERY

A. Coordinate with Owner: Deliver and unload spare products to Owner at Owner’s Maintenance Facility and obtain receipt prior to final payment.

B. For portions of project accepted and occupied by Owner prior to substantial completion, deliver a proportional part of spare products to Owner; obtain receipt.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:
1. Taking down, cutting away, breaking out and removing portions of the existing site to accommodate new construction.
2. Disconnecting, capping and removing identified utilities.
3. Offsite disposal and/or salvaging for reinstallation, indicated components.

B. RELATED SECTION
1. Section 01 11 00 – Summary of Work: Instructions concerning hazardous materials
2. Section 01 50 00 – Temporary Facilities and Controls
3. Section 01 77 00 – Closeout submittal

1.02 PROJECT CONDITIONS

A. Occupancy: Owner will occupy the buildings and will inform Contractor. Conduct demolition work in manner that will minimize need for disruption of Owner's operations.

B. Existing Conditions: Owner assumes no responsibility for actual condition of items or structures to be demolished. Contractor shall visit the site and verify the nature and extent of demolition required. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable.

C. Property Protection: Contractor shall be responsible for the protection of adjoining property, including all parts of the site outside the limits of demolition and outside the limits of the new construction. Protect buildings, paving, and utilities from damage by equipment and trucks. Various utilities are identified to be protected and remain in the drawings. Other utilities are to be protected until new services are installed.

1.03 SUBMITTAL

A. Submit demolition and removal procedures and schedule under provisions of SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULES.

B. Submit record documents under provisions of SECTION 01 77 00 – CLOSEOUT SUBMITTALS. Accurately record actual locations of capped utilities and subsurface obstructions.

1.04 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent portion of site to remain.

B. Conduct operations with minimum interference with Owner's usage of buildings. Maintain protected egress and access at all times and maintain protected egress at fire exists as required by the Fire Marshall.

C. Underground utilities are shown on plans based on survey and city information. Contractor should assume there are underground utilities not shown on plans.

1.05 PROTECTION

A. It is essential that there be minimal interruptions of existing utilities. Any disruption of service to the owner or adjoining properties must not be done without written notification and approval.

B. Take care to ensure that there will be no damage to elements or portions thereof which are not required to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing portions of site and its parts to remain.

C. Erect and maintain temporary bracing, shoring, lights, barricades, signs and other means to protect workers and other persons, and finishes and improvements to remain from damage; all in accordance with applicable regulatory requirements.

D. Protect existing trees to remain. Keep area within the drip line clear of construction traffic, parking, soil contaminations, soil stockpiling, storage of materials, debris and ponding water. Locate temporary fencing around trees to remain along dripline.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable building codes for disposal of debris.

B. Coordinate clearing Work with Owner and utility companies. Contact utility locates, which includes DIGTESS for franchise utilities and the City for public utilities

C. Conform with applicable portions of OSHA, including 1926.604.

PART 2 – PRODUCTS

2.01 GENERAL

A. Materials designated for demolition shall become the Contractor's property; remove and dispose of such materials unless otherwise indicated or specified. Sales of salvage materials are not allowed on site.

B. Items to remain the Owner's property will be removed by him prior to the start of demolition (or will be designated on the drawings herein or to be removed and stored by Contractor). Items not so designated shall be considered debris and shall be removed and disposed of accordingly.

C. Carefully disconnect, remove and protect items directed by the Owner to be salvaged.

D. Transport salvaged items to on-site storage areas designated by the Owner.

PART 3 – EXECUTION

3.01 INSPECTIONS

A. Prior to starting demolition, make inspection and report observable defects and structural weaknesses of construction designated for demolition, of adjacent structures, and of improvements to remain. If unsatisfactory conditions exist, do not commence demolition until appropriate determinations have been made.

B. Following demolition, make inspection and report defects and structural weaknesses of items partially demolished, cut, or removed, of adjacent structures; and or improvements remaining.

3.02 PREPARATION

A. Prevent movement or settlement of adjacent structures. Provide bracing, shoring and underpinning as required.

B. Protect existing appurtenances, structures and landscaping which are not to be demolished.

C. Locate, disconnect, remove and cap designated utility lines within demolition areas.

D. Mark location of disconnected utilities. Identify utilities and indicate capping locations on Project Record Documents.

3.03 PERFORMANCE

A. Demolition: Carry out the work carefully and in an orderly manner to minimize noise, dust and vibration. Remove all items and parts so shown and noted on the drawings and as otherwise may be required to be removed to carry out the work.

B. Clearing:
1. Remove trees, shrubs and other vegetation from within the area of the site where new construction is to be placed. Grub out roots to a depth of at least 18 inches below natural grade.
Dig out and remove buried obstructions to a depth of 24 inches below natural grade or 24 inches below the intended excavation elevation, whichever is lower. Remove existing trash, debris and abandoned facilities, which are to be removed from the site.
2. Remove abandoned underground utilities from within the area of the site where new construction is to be placed. Cut and cap piping and conduit encountered below grade that is outside the limits of new construction. Relocate, outside of new construction areas, utility services for buildings to remain in operation.
3. Prior to the removal of any buildings, verify all the utility services are disconnected and coordinate with the Architect on protecting any building(s) to remain.
3. Clear undergrowth and deadwood, without disturbing subsoil.
4. Burning debris on site is not permitted.
5. Remove debris, rock, fences, and extracted plant life from site.

C. Shoring: Provide temporary shoring wherever present supports are removed or weakened. Any settling or cracking of the existing construction due to the removal of supports and faulty or insufficient shoring shall be the responsibility of the contractor and shall be repaired at no additional expense to the Owner.

D. Material and Equipment Disposal:
1. The materials and items of equipment which are noted and shown to be salvaged and re-used in new locations or re-used for patching shall be carefully removed and safely stored until ready for reinstallation.
2. Other items and all debris shall become the property of the Contractor and shall be removed from the premises entirely. Under no circumstances shall debris be allowed to accumulate.

E. Damage: Any existing construction to be left in place which is damaged by the demolition operations shall be refinished or replaced at no additional expense to the Owner. The repair of such damage shall leave the parts in a condition at least equal to that found at the start of the work.

F. Perform demolition in accordance with ANSI 10.6 and applicable regulatory requirements.

G. Remove items designated for demolition within the limits of work indicated and as required to perform the work. Do not remove anything beyond the limits of demolition indicated without the prior written approval of Architect. If in doubt whether to remove an item, obtain written approval prior to proceeding.

H. If in the event hazardous materials (asbestos, PCB's etc.) are encountered during the course of the demolition work, or if it is even suspected that such materials will or have been encountered cease work immediately in the affected area and promptly notify the Owner and Architect.

I. Remove all building foundation systems four feet (4') minimum below existing ground.

J. Remove all trees and associate roots to 2 feet (2') minimum below existing ground.

K. Remove all existing underground utilities within limits of demolition. Cap utilities at property line. Call for locates and use other means as deemed necessary to locate, identify and demolish.

3.04 CUTTING

A. Make new openings neat, as close as possible to profiles indicated and only to extent necessary for new work.

B. At concrete paving and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and –coring equipment. Do not over-cut at corners of cut openings.

C. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

3.05 PIPES, DUCTS AND CONDUITS

A. Remove deactivated mechanical, plumbing and sprinkler piping, ducts and electrical conduit, including fastenings, connections and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.

B. Cap deactivated piping systems at points of cutoff.

3.06 CLEAN UP

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

3.07 SURVEY

A. Provide as-built survey of any foundation systems or other underground improvement exposed but left in place. Use same control as original survey and deliver to the architect in a CAD file.

END OF SECTION

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Taking down, cutting away, breaking out and removing portions of the existing buildings to accommodate new construction.
2. Disconnecting, capping and removing identified utilities.
3. Offsite disposal and/or salvaging for reinstallation, indicated components.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Instructions concerning hazardous materials.
2. Section 01 35 00 - Alteration Project Procedures: Re-installation of removed materials.
3. Section 01 50 00 - Temporary Facilities and Controls: Barricades; Dust control.
4. Section 01 78 39 - Project Record Documents.

1.2 SUBMITTALS

A. Submit demolition and removal procedures and schedule under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Submit record documents under provisions of SECTION 01 78 39 - PROJECT RECORD DOCUMENTS. Accurately record actual locations of capped utilities and subsurface obstructions.

1.3 PROJECT CONDITIONS

A. Occupancy: Owner will be continuously occupying portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's operations.

B. Existing Conditions: Owner assumes no responsibility for actual condition of items or structures to be demolished. Contractor shall visit the buildings and verify the nature and extent of demolition required. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structures may occur by Owner's removal and salvage operations prior to start of selective demolition.

C. Property Protection: Contractor shall be responsible for the protection of adjoining property, including all parts of the building outside the limits of demolition and site improvements outside the limits of the new construction.

1.4 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent portion of structures to remain.

B. Conduct operations with minimum interference with Owner's usage of buildings**.** Maintain protected egress and access at all times and maintain protected egress at fire exits as required by the Fire Marshall.

1.5 PROTECTION

A. It is essential that there be minimal interruptions of existing mechanical and electrical systems in addition to the normal operation of Owner's facilities.

B. Take care to ensure that there will be no damage to elements or portions thereof which are not required to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing portions of building and its parts to remain.

C. Erect and maintain temporary bracing, shoring, lights, barricades, signs and other means to protect workers and other persons, and finishes and improvements to remain from damage; all in accordance with applicable regulatory requirements.

D. Erect and maintain temporary barriers to confine dust and debris.

E. Protect existing trees to remain. Keep area within the drip line clear of construction traffic, parking, soil contamination, soil stockpiling, storage of materials, debris and ponding water.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials designated for demolition shall become the Contractor's property; remove and dispose of such materials unless otherwise indicated or specified. Sales of salvage materials are not allowed on site.

B. Furnishings and equipment items to remain the Owner's property will be removed by him prior to the start of demolition (or will be designated on the drawings herein or to be removed and stored by Contractor). Items not so designated shall be considered debris and shall be removed and disposed of accordingly.

C. Carefully disconnect, remove and protect items directed by the Owner to be salvaged.

D. Transport salvaged items to on-site storage areas designated by the Owner.

PART 3 - EXECUTION

3.1 INSPECTIONS

A. Prior to starting demolition, make inspection and report observable defects and structural weaknesses of construction designated for demolition, of adjacent structures, and of improvements to remain. If unsatisfactory conditions exist, do not commence demolition until appropriate determinations have been made.

B. Following demolition, make inspection and report defects and structural weaknesses of items partially demolished, cut, or removed, of adjacent structures; and of improvements remaining.

3.2 PREPARATION

A. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

B. Prevent movement or settlement of adjacent structures. Provide bracing, shoring and underpinning as required.

C. Protect existing appurtenances, structures and landscaping which are not to be demolished.

D. Locate, disconnect, remove and cap designated utility lines within demolition areas.

E. Mark location of disconnected utilities. Identify utilities and indicate capping locations on project record documents.

F. Provide weatherproof closures for exterior openings resulting from demolition work.

3.3 PERFORMANCE

A. Demolition: Carry out the work carefully and in an orderly manner to minimize interference with the daily operations in the building and to avoid damage to permanent parts of the building and the equipment therein. Hold noise, dust and vibration to a minimum. Remove all items and parts so shown and noted on the drawings and as otherwise may be required to be removed to carry out the work.

B. Shoring: Provide temporary shoring for walls and framing wherever present supports are removed or weakened. Any settling or cracking of the existing construction due to the removal of supports and faulty or insufficient shoring shall be the responsibility of the contractor and shall be repaired at no additional expense to the Owner.

C. Material and Equipment Disposal:
   1. The materials and items of equipment which are noted and shown to be salvaged and re-used in new locations or re-used for patching shall be carefully removed and safely stored until ready for reinstallation.
   2. Other items and all debris shall become the property of the Contractor and shall be removed from the premises entirely. Under no circumstances shall debris be allowed to accumulate.

D. Damage: Any existing construction to be left in place which is damaged by the demolition operations shall be refinished or replaced at no additional expense to the Owner. The repair of such damage shall leave the parts in a condition at least equal to that found at the start of the work.

E. Perform demolition in accordance with ANSI A10 - Construction and Demolition Standards, ANSI A10.6 – Safety and Health Program Requirements for Demolition Operations, and applicable regulatory requirements.

F. Remove items designated for demolition within the limits of work indicated and as required to perform the work. Do not remove anything beyond the limits of demolition indicated without the prior written approval of Architect. If in doubt whether to remove an item, obtain written approval prior to proceeding.

G. If in the event hazardous materials (asbestos, PCB's etc.) are encountered during the course of the demolition work, or if it is even suspected that such materials will or have been encountered cease work immediately in the affected area and promptly notify the Owner and Architect.

3.4 CUTTING

A. Make new openings neat, as close as possible to profiles indicated and only to extent necessary for new work.

B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.

C. At concrete, masonry, paving and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and -coring equipment. Do not over-cut at corners of cut openings.

D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

3.5 PIPES, DUCTS AND CONDUITS

A. Remove deactivated mechanical, plumbing and sprinkler piping, ducts and electrical conduit, including fastenings, connections and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.

B. These facilities above ceilings may remain in place if their presence does not result in interference with new work, in which case they shall be removed to extent necessary.

C. Cap deactivated piping systems at points of cutoff.

3.6 RECONDITIONING EXISTING SUBSTRATES

A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen and other adhering materials, as necessary to furnish acceptable substrates for new materials.

B. Perform sandblasting, chipping, grinding, acid washing, etching and other work as required by conditions encountered and new materials involved.

C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing and drying, as applicable.

D. Determine substrate requirements for reconditioned surfaces in cooperation with the manufacturer's representative and installer of each new material involved.

3.7 CLEAN UP

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

END OF SECTION

SECTION 03 11 00

STRUCTURAL CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Shoring, formwork and re-shoring of structure.
   2. Furnish, install and removal of concrete formwork.

1.2 REFERENCES

A. Codes and Specifications
   1. American Concrete Institute (ACI)
      a. ACI 117, Specification for Tolerances for Concrete Construction and Materials
      b. ACI 301, Specifications for Structural Concrete
      c. ACI 318, Building Code Requirements for Structural Concrete
      d. ACI 347R, Guide to Formwork for Concrete
   2. Concrete Reinforcing Steel Institute (CRSI)
      a. Manual of Standard Practice
   3. American Society for Testing Materials (ASTM)
      a. ASTM C203, Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
      b. ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics
      c. ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.3 SUBMITTALS

A. Shop Drawings:
   1. Submit shop drawings for formwork.
   2. Submit description of shoring, re-shoring and backshoring procedures, indicating magnitude of loads assumed, signed and sealed by licensed design engineer
   3. Submit size and layout of sleeves and openings in structural members, required by trades, prior to releasing reinforcing, formwork and studrail shop drawings for fabrication.

B. Construction Joints: Submit diagrams of construction joints.

C. Form Ties: For Architecturally exposed concrete, submit layout of form tie spacing.

D. Product Data:
   1. Form release agent
   2. Fiberboard void forms
   3. Void retainer panels
   4. Vapor retarder

E. Samples:
   1. Rustication forms
   2. Reglet
   3. Dove-tailed anchor slots

F. Unless otherwise indicated, submit the following for each type of product provided under Work of this Section:
   1. Product Disclosure:
      a. If available, provide product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which product manufacturer is explicitly recognized as a participant by program operator.

b. If available, provide third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of product contents.
c. If available, provide published Health Product Declaration (HPD) for each product documenting the role, amount, and health hazards for every product ingredient.

2. Recycled Content:
   a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   b. Indicate material cost of product less labor included in Project.
   c. If recycled content is part of an assembly, indicate percentage of pre-consumer and post-consumer recycled contents in assembly by weight.
3. Local / Regional Materials:
   a. Indicate extraction, manufacture, and purchase location of products; indicate distance between points of extraction, manufacture, and purchase and Project site.
   b. Indicate material cost less labor of products extracted, manufactured, and purchased within 100 miles of Project site.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials off ground and protected from weather.
   1. Prevent warpage, twisting and excessive moisture gain of wood materials.
   2. Discard damaged or deformed materials.

B. Protect smooth faces of form liner materials from abrasion, denting or scarring during handling.

PART 2 - PRODUCTS

2.1 GENERAL

A. Design, erect, shore, brace and maintain formwork according to ACI 301 to withstand vertical, lateral, static, dynamic and construction loads applied prior to concrete structure reaching adequate strength to support such loads.

B. Limit form deflections to provide smooth, straight surfaces without unsightly bulges and deformations.

C. Limit form deformations for architecturally exposed surfaces to 0.0025 times the span of each component (facing material, studs and walers).

2.2 MATERIALS

A. Wood forms for unexposed concrete surfaces: No. 2 Southern Yellow Pine or Douglas Fir dressed to uniform and smooth contact surfaces.

B. Wood forms for concrete surfaces exposed to view: Commercial Standard Douglas Fir concrete form plywood, moisture resistant, not less than 5 plies, and minimum thickness of 9/16 inch. Line forms with one of the following:
   1. Plywood: Commercial Standard Douglas Fir, concrete form, exterior, 3 ply, not less 1/4 inch thick with one smooth face.
   2. Fiberboard: Treated, hard pressed fiberboard, moisture resistant, not less than 3/16 inch thick with one smooth side.

C. Void retainers:
   1. Precast Concrete Panels. 1 ½ inches thick, 3000 psi lightweight or normal weight concrete, reinforced with 4x4-W1.4 welded wire mesh.
   2. Lightweight, ribbed, high density polyethylene panels specially made to prevent migration of backfill soil under foundation elements. Required minimum panel height: 14 inches for 8 inch void space and smaller; 20 inches for larger than 8 inch and up to 12 inch void space; 26 inches for larger than 12 inch and up to 16 inch void space.
      a. Example product: SureRetainer by VoidFormProducts, Englewood, CO

3. Extruded polystyrene foam panel: Two inch minimum thickness with square edges. Minimum compressive strength of 25 psi (ASTM D1621) and minimum flexural strength of 60 psi (ASTM C203). Example products:
   a. Foamular 250 Rigid Foam Insulation by Owens Corning
   b. Styrofoam Highload 40 Extruded Polystyrene Insulation by Dow

2.3 COMPONENTS

A. Rustications: steel, polyvinyl chloride or milled and sealed white pine.

B. Dove-tailed anchor slots: compatible with specified dove-tailed anchors for masonry veneer.

2.4 MANUFACTURED UNITS

A. Fiberboard void forms (void boxes): manufactured using corrugated paper material with water resistant fiberboard material exterior, capable of supporting weight of wet concrete without crushing but non-durable in long-term (deteriorates over time with absorption of moisture). Void forms to be laminated using moisture resistant adhesive.
   1. Provide pre manufactured shapes required (rectangular, etc.)
   2. Provide special shapes adjacent to round or skewed components.
      a. Do not cut fiberboard void forms in field.
   3. Provide caps at each end of units.
   4. Provide a layer of protective cover board over void forms to distribute working load and protect void forms from puncture and other damage during concrete placement.
      a. Example cover board: ¼ inch minimum thickness hardboard/fiberboard

B. Vapor retarder at slab on void:
   1. Vapor Barrier membrane must have the following properties:
      a. Permeance as tested after mandatory conditioning (ASTM E154) less than 0.01 Perms
      b. Strength: ASTM E1745 Class A
      c. Thickness: 15 mils minimum
      d. Approved Product: VBC-350 by Barrier-Bac, Inc
      e. Approved Alternate: Stego Wrap 15 mil Vapor Barrier with Crete Claw Tape by Stego Industries LLC

2.5 ACCESSORIES

A. Form ties: bolt rods or patented devices of sufficient strength to withstand pressure due to wet concrete (3000 pounds minimum tensile strength); adjustable in length, and removable to depth of at least 1 inch from face of concrete.
   1. Equip ties for exposed concrete surfaces with plastic cones 5/8 inch in diameter.
   2. Do not use wire ties, or makeshift ties that leave unsightly marks or depressions on face of concrete.

B. Form release agent:
   1. Does not bond with, stain, or adversely affect concrete surfaces.
   2. Meets acceptable air quality standards.

2.6 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document product's environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document chemical inventory of product to at least 0.1 percent.

2.7 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below industry average in the following categories:
   1. Global warming potential
   2. Depletion of stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of pre-consumer recycled content constitutes at least 25 percent of total value of materials in Project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk programs.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products sourced within 100 miles of Project site.

PART 3 - EXECUTION

3.1 DESIGN AND CONSTRUCTION

A. Design formwork for concrete elements to have correct dimension, shape, alignment, elevation, and position with dimensional tolerances conforming to ACI 117. Reference ACI 347R.

B. Design formwork to safely support vertical and lateral loads until such loads can be supported by concrete structure. Carry vertical and lateral loads to ground by formwork system or by in-place construction of adequate strength.

C. Form sides of concrete elements unless specifically noted or shown otherwise in the Contract Documents.
   1. Dimensional tolerances to conform to ACI 117.
   2. Repair bulges, offsets and formwork conditions that would cause beam sides to become skewed or wider than void box bottom forms prior to placing concrete.

D. Construct forms to required shapes, lines and dimensions; provide necessary studs, walers, ties, centering, molds and supports.
   1. Install forms sufficiently tight to prevent leakage of mortar.
   2. Construct forms to be easily removable without damage to finished surfaces.
   3. Provide forms without unsightly marks or deformations on exposed faces.
   4. Thoroughly clean forms of concrete laitance before re-use.
   5. Provide clean-outs at base of vertical forms for removal of foreign materials before concrete placement.

E. Tying of forms: provide sufficient form ties to prevent bulging or collapse of forms under weight of wet concrete.
   1. Place ties in uniform and orderly pattern.
   2. Lubricate ties to prevent bonding with concrete.

F. Special features: place in forms any wood strips, blocking, molding, and liners necessary to produce required shapes.
   1. Attach feature strips to forms in a manner that will not leave unsightly marks on exposed concrete surfaces.
   2. Coat wood strips, blocking and molding with form sealer.

3. Provide 3/4 inch chamfer strips along edges of permanently exposed concrete unless noted otherwise in Contract Documents.
4. Provide dove-tailed anchor slots coordinated with masonry.

G. Coatings:
1. Coat contact surfaces of wood forms with form release agent before each use and before placing reinforcement.
2. Apply form release agent per manufacturer's recommendations.
3. Do not allow excess release agent to accumulate in forms or to contact hardened concrete against which fresh concrete will be placed.
4. Remove release agent from reinforcement before placing concrete.

H. Construction joints:
1. Locate construction joints as shown on approved submittals.
a. Do not locate construction joints between lateral bracing elements of walls and columns.
b. Locate construction joints in beams and slabs approximately at midspan between supports.
c. Provide plumb and level construction joints. Avoid irregular lines at horizontal construction joints in exposed concrete faces by tacking a continuous strip of dressed lumber, 1 inch thick, to inside of wall or grade beam form, with its lower edge at line of construction joint. About one hour after placing concrete in lower part of wall or grade beam, remove strip, level off irregularities in joint line with wood float and remove laitance.
d. Provide shear keys and waterstops as required in construction joints.

I. Fiberboard Void Boxes:
1. Ensure subgrade is clean and dry before installing void boxes.
2. Place void cartons tightly end-to-end.
3. Place and arrange void cartons so that horizontal concrete surfaces that would otherwise be in contact with soil are protected by void boxes. Protect cartons from rain and mud.
4. Secure void cartons firmly in place so that position will not be altered by activities of workmen or placement of concrete. Secure with waterproof tape.
5. Do not cut fiberboard void box components in field.
6. Replace partially or wholly collapsed cartons.
7. Install vapor retarder in accordance with ASTM E1643
8. Install protective cover board according to manufacturer's instructions.

J. Void Retainers:
1. Prior to installing retainers, inspect void spaces to ensure voids are intact and that concrete or other material has not entered void space.
a. Where void space is not intact, remove excess concrete or other material prior to installing void retainers.
2. Install void retainers as shown in Contract Documents or in accordance with manufacturer's written instructions, including overlap on side of beam or wall and penetration into subgrade. Where discrepancies occur, the most stringent shall govern.
3. Cut retainer material for tight fit at corners. Tape corners to ensure panels remain accurately in place during backfilling and that backfill soil does not enter void space.
4. Monitor performance of retainer panels continuously during backfilling. If panels shift, or soil enters void space, stop work and adjust installation to assure satisfactory performance.
5. Void height tolerance: plus 2 inches, minus 0 inches of height shown in Contract Documents.

3.2 REMOVAL OF FORMS

A. Remove forms completely, unless specifically required otherwise.

B. Remove forms carefully to avoid damage to concrete surfaces.

C. Do not remove forms until concrete is adequately set.
1. Clamps and tie rods may be loosened after 24 hours following placement of concrete.
a. Maintain sufficient ties to hold forms in place.
b. Withdraw through-wall ties toward the inside (or unexposed) face of walls and beams.
c. Prevent spalling during tie removal.
2. Use concrete strength tests as evidence that concrete has adequately set for form removal.

a. Minimum strength is 75 percent of design strength.
b. For post-tensioned concrete, do not remove forms until engineer of record reviews and approves tendon elongations.

D. Remove forms sequentially and in small units to prevent shock, overload or undue eccentricity in structure. Do not store materials or place heavy equipment on structures of which forms have been removed unless concrete strength is equal to design strength, or re-shores are installed. Remove forms in a manner that does not require a large portion of the structure to be self-supporting (i.e. a full bay of framing). Install re-shores immediately as form removal progresses.

E. Do not remove forms until supporting structures are permanently in place and full strength.

F. Re-shore structure required to support subsequent construction. Install re-shores plumb and tight to structure and concentric with form supports. Provide re-shore materials with safe load capacity sufficient for transfer of required loads. Re-shore sufficient levels of structure so that imposed loads due to forms, wet concrete and construction loads do not exceed the combined live load capacity of levels to which re-shores extend. Space re-shores sufficiently close together to provide uniform distribution of load to supporting structure.

END OF SECTION

SECTION 03 15 00

EMBEDDED METAL ASSEMBLIES AND INSERTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel assemblies to be embedded
2. Anchors

1.2 REFERENCES

A. Codes and Specifications
1. Concrete Reinforcing Steel Institute (CRSI)
a. Manual of Standard Practice.
2. American Institute of Steel Construction (AISC)
a. AISC 360, Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
3. American Welding Society (AWS)
a. AWS D1.1, Structural Welding Code - Steel.
b. AWS D1.4, Structural Welding Code - Reinforcing Steel.
c. AWS D1.8, Structural Welding Code – Seismic Supplement
4. American Concrete Institute (ACI)
a. ACI 318, Building Code Requirements for Reinforced Concrete.
b. SP-066, ACI Detailing Manual
5. American Society for Testing and Materials (ASTM)
a. ASTM A36, Standard Specification for Carbon Structural Steel.
b. ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
c. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
d. ASTM A283, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
e. ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
f. ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
g. ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
h. ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
i. ASTM A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
j. ASTM F3125, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

1.3 SUBMITTALS

A. Product Data
1. Submit manufacturer's data indicating product compliance for the following:
a. Headed stud anchors
b. Deformed bar anchors
c. Rust inhibitor
d. Zinc coating
e. Threaded inserts
f. Anchor slots

B. Shop Drawings:
1. Submit shop and installation drawings for review by Architect, including:
a. Shop and field connection details

b. Material grades and sizes
c. Details of fabrication
2. Do not begin fabrication prior to review of shop drawings.
3. Review of shop drawings is for member sizes, spacings, detail, and general compliance with Contract Documents only.
4. Material quantities, lengths, fit, verification of job conditions, and coordination with other trades are responsibility of Contractor.

C. When requested by Owner or Architect, submit welders' certifications.

D. Unless otherwise indicated, submit the following for each type of product provided under Work of this Section:
1. Product Disclosure:
a. If available, provide a product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which product manufacturer is explicitly recognized as a participant by program operator.
b. If available, provide a third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of product contents.
c. If available, provide a published Health Product Declaration (HPD) for each product documenting role, amount, and health hazards for every product ingredient.
2. Recycled Content:
a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
b. Indicate material cost of product less labor included in project.
c. If recycled content is part of an assembly, indicate percentage of pre-consumer and post-consumer recycled contents in assembly by weight.
3. Local / Regional Materials:
a. Indicate location of extraction, manufacture, and purchase of products; indicate distance between points of extraction, manufacture, and purchase and Project site.
b. Indicate material cost less labor of products extracted, manufactured, and purchased within 100 miles of Project site.

1.4 QUALITY ASSURANCE

A. Qualifications
1. Fabricator:
a. Minimum of 3 years of experience in related or similar work.
2. Welders:
a. Certified for type of welding required within previous 6 months.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store fabricated assemblies and inserts under cover and off ground to protect against corrosion prior to placement.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel
1. W Shapes and WT’s: ASTM A992
2. Angles, Channels, Plates and Rods: ASTM A36.
3. Steel straps: ASTM A283 or A1011.
4. Bolts: ASTM A307, with regular hexagon nuts and carbon steel washers.
5. High Strength Bolts: ASTM F3125.

B. Reinforcing Bars
1. Deformed Bars: ASTM A615 of required grades.
2. Welded Wire Reinforcement: Conform to ASTM A1064.
3. Bars to be welded: ASTM A706 of required grades..

C. Fusion Welded Anchors
   1. Headed Stud Anchors: Conform to ASTM A108, Grades 1010 through 1020, with sizes and lengths as shown in Contract Documents, and conforming to AWS D1.1, Section 7.
   2. Deformed Bar Anchors: Low carbon steel, conforming with ASTM A1064, with sizes and lengths as shown in Contract Documents.
      a. Example product: Type DA, as manufactured by Blue Arc Stud Welding Division of Erico Industries.

D. Welding Electrodes: AWS E70. For welding of ASTM A706 rebar, use AWS E80 electrodes.

E. Coatings
   1. Rust Inhibitor:
      a. Example product: Hi-Build Epoxoline as manufactured by Tnemec Co.
   2. Hot-dip Galvanizing: Conform to ASTM A153.
   3. Cold Galvanizing:
      a. Example product: Galvilite as manufactured by ZRC WORLDWIDE

F. Inserts
   1. Threaded Inserts: Rated for tensile strength of bolt size given in Contract Documents (ultimate strength).
   2. Anchor Slots to receive inserts for anchoring masonry units, cast stone, and marble to concrete: One inch wide, 7/8 inch deep, continuous No. 24 gauge, galvanized sheet steel, dovetailed slots, complete with felt lining.
      a. Example manufacturer: Hohmann & Barnard, Inc., New York, N.Y.
   3. Miscellaneous: PVC pipes, or other special inserts as shown in Contract Documents, or as required by other trades.

2.2 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document product's environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document chemical inventory of product to at least 0.1%.

2.3 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below industry average in the following categories:
   1. Global warming potential
   2. Depletion of stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that sum of post-consumer recycled content plus one-half of pre-consumer recycled content constitutes at least 25 percent of total value of materials in Project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk programs.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products that are sourced within 100 miles of Project site.

2.4 FABRICATION

A. Fabricate and assemble structural steel items in shop. Carefully and accurately shear, flame cut, and chip materials as required. Cut, drill, or punch holes at right angles to surface of metal. Do not enlarge holes by burning. Cut holes cleanly without torn or ragged edges. Weld in accordance with AISC Specifications and with AWS D1.1 and D1.4. Permit only AWS certified welders to perform welds.

B. Weld deformed bar anchors and headed stud anchors by full-fusion process. Weld in accordance with manufacturer's recommendations regarding equipment, conditions of material, and temperature.
   1. Example processes:
      a. Nelson Stud Welding Company
      b. KSM Welding Services Division, Omark Industries.

C. Hot-dip galvanize steel assemblies and accessories exposed to weather or soil. Hot-dip galvanize steel embeds used within crawl space environments.

D. Plainly mark and match-mark assemblies and inserts to correspond to placement drawings and diagrams.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Clean assemblies and inserts of corrosion, dirt, oil, grease and laitance before placing in forms.

B. Place assemblies and inserts in forms and securely anchor in required positions with correct orientations. Use templates, diagrams and instructions provided by Fabricator for proper alignment and positioning.

3.2 FIELD QUALITY CONTROL

A. Laboratory Testing: provide independent testing laboratory services as follows:
   1. Inspect steel fabrications for sizes, spacings and general quality of fabrication.
   2. Inspect welding of steel fabrications for size, length and quality.
   3. Inspect positioning of assemblies and inserts in forms.
   4. Visually inspect welds at anchors and shear stud connectors. Test studs which do not appear to have full sound 360 degree fillet weld at base. Test by bending 15 degrees. Replace studs which fail this test.

B. Afford full cooperation and access to Work to testing laboratory and provide adequate notice to laboratory of when Work is ready for testing and inspection so that services can be carried out in full, allowing sufficient time for making corrections without delaying progress of Work.

3.3 ADJUSTING

A. Field Touch Up
   1. Use cold galvanizing compound in accordance with manufacturer's recommendations for field touch-up.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Preparation of shop drawings
2. Fabrication and placement of reinforcing

B. Products Furnished, not Installed Under This Section
1. Pier reinforcing

1.2 REFERENCES

A. Codes and Specifications
1. American Concrete Institute (ACI)
a. ACI 318, Building Code Requirements for Reinforced Concrete
b. SP-066, ACI Detailing Manual
2. Concrete Reinforcing Steel Institute (CRSI)
a. Manual of Standard Practice
3. American Welding Society (AWS)
a. AWS D1.4, Structural Welding Code - Reinforcing Steel
4. American Society for Testing Materials (ASTM)
a. ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
b. ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
c. ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
d. ASTM A775, Standard Specification for Epoxy-Coated Steel Reinforcing Bars
e. ASTM A767, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
f. ASTM A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
g. ASTM D3963, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars

1.3 SUBMITTALS

A. Shop Drawings
1. Submit shop and installation drawings for review by Architect, including:
a. Reinforcing sizes and quantities
b. Reinforcing lengths and bending details
c. Placement instructions
d. Details and spacing of reinforcing supports
e. References to reinforcing designations in Contract Documents
f. Notes regarding reinforcing placement in Contract Documents
2. Review of Shop Drawings will be for reinforcing sizes, spacing, and general detail only; excluding quantities, lengths and fit of materials.
3. Do not use reproductions of Contract Documents for shop drawings.

B. Quality Control Submittals
1. Submit certified mill reports, evidencing compliance with Specification requirements.
2. Submit laboratory testing and inspection reports.

C. Unless otherwise indicated, submit the following for each type of product provided under Work of this Section:
1. Product Disclosure:

a. If available, provide product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which product manufacturer is explicitly recognized as a participant by program operator.
b. If available, provide third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of product contents.
c. If available, provide published Health Product Declaration (HPD) for each product documenting role, amount, and health hazards for every product ingredient.

2. Recycled Content:
a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
b. Indicate material cost of product less labor included in Project.
c. If recycled content is part of an assembly, indicate percentage of pre-consumer and post-consumer recycled contents in assembly by weight.

3. Local / Regional Materials:
a. Indicate extraction, manufacture, and purchase location of products; indicate distance between points of extraction, manufacture, and purchase and Project site.
b. Indicate material cost less labor of products extracted, manufactured, and purchased within 100 miles of Project site.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in tagged bundles grouped by reinforcing size and length.

B. Store reinforcing on skids off ground and stacked to permit drainage. Prevent build-up of rust and dirt on reinforcing. Protect reinforcing from contamination that would prevent bonding of concrete.

C. Do not bend, twist or warp reinforcing during handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel
1. Deformed bars: new billet steel conforming to ASTM A615 of required grades.
2. Smooth bars: conform to ASTM A615
3. Welded wire reinforcement: conform to ASTM A1064.
4. Reinforcing bars to be welded: conform to ASTM A706.

2.2 ACCESSORIES

A. Concrete bricks or chairs with bearing plates: Provide where supports are in contact with soil or vapor barrier.

B. Plastic-tipped chairs: Provide of suitable color where concrete soffits will be exposed to view.

2.3 BAR COATINGS

A. Epoxy Coating: conform to ASTM A775, ASTM D3963.

B. Hot-dip galvanizing: conform to ASTM A767.

2.4 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document product’s environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document chemical inventory of product to at least 0.1 percent.

2.5 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below industry average in the following categories:
   1. Global warming potential
   2. Depletion of stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of pre-consumer recycled content constitutes at least 25 percent of total value of materials in Project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk programs.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products sourced within 100 miles of Project site.

2.6 FABRICATION

A. Shop Fabrication
   1. Cut reinforcing to required lengths
   2. Bend reinforcing cold with suitable equipment. Do not heat or stretch material. Provide bend radii and extensions in conformance with ACI 318.
   3. Do not use reinforcing with kinks or unrequired bends.
   4. Do not re-straighten reinforcing bent more than 30 degrees.

B. Tolerances: conform to ACI 318.

C. Marking: mark reinforcing to correspond with shop drawings.

D. Provide uncoated bars unless noted otherwise in Contract Documents.

2.7 SOURCE QUALITY CONTROL

A. Testing Laboratory Services
   1. Inspect fabricating and bending procedures
   2. Inspect fabricated materials

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean reinforcing of ice, dirt, loose rust, mill scale, oil, and grease.

B. Repair of damaged epoxy coating: conform to ASTM D3963

C. Repair of damaged galvanizing: conform to ASTM A780
   1. Example product: Galvilite by ZRC Worldwide

3.2 PLACEMENT

A. Place reinforcing of required sizes and quantities in proper position. Use sufficient supports and spacers to maintain position during concrete placement.
   1. Do not place reinforcing supports against exposed faces of precast panels, beams, walls or copings.

B. Secure reinforcing in position with wire ties complying with ACI 318.
   1. Clip or bend tails of tie wire away from exposed faces, do not leave tie wire within 1 1/2" of any exposed surface.

C. Concrete Cover: comply with ACI 318 and Contract Documents.

D. Tolerances
   1. Concrete cover to unformed surfaces
      a. Members 8 inches deep or less: plus 1/4 inch
      b. Members more than 8 inches deep: plus 1/2 inch
   2. Concrete cover to formed surfaces: plus 1/4 inch
   3. Longitudinal location of bends and ends of reinforcement: plus 2 inches
   4. Spacing between reinforcing bars: 1/4 inch

E. Support reinforcing in slabs-on-grade and slabs-on-deck on bolsters or blocks. Do not lift reinforcing during concrete placement.

3.3 COLD BENDING OF BARS IN FIELD

A. Dowels connecting concrete of different pour sequences may be bent in field to facilitate form placement and removal with the following conditions:
   1. Maximum bar size is #5
   2. Maximum bend angle is 90 degrees
   3. Bars may be bent and straightened one time only

3.4 FIELD QUALITY CONTROL

A. Testing Laboratory Services
   1. Inspect reinforcing sizes, quantities and placement.
   2. Inspect support and securement of reinforcing.
   3. Inspect condition of reinforcing.

END OF SECTION

SECTION 03 31 00

STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Design of concrete mixes
2. Furnishing and placing cast-in-place concrete
3. Curing and finishing of concrete
4. Waterstops
5. Non-shrink grout

B. Products Furnished, not Installed, under this Section
1. Concrete for drilled piers

1.2 REFERENCES

A. American Concrete Institute (ACI)
1. ACI 117, Specification for Tolerances for Concrete Construction and Materials
2. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
3. ACI 213, Guide for Structural Lightweight – Aggregate Concrete
4. ACI 214, Guide to Evaluation of Strength Test Results of Concrete
5. ACI 301, Specifications for Structural Concrete
6. ACI 302.1, Guide to Concrete Floor and Slab Construction
7. ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete
8. ACI 305.1, Specification for Hot Weather Concreting
9. ACI 306.1, Standard Specification for Cold Weather Concreting
10. ACI 308, Guide to External Curing of Concrete
11. ACI 309, Guide for Consolidation of Concrete
12. ACI 318, Building Code Requirements for Structural Concrete and Commentary
13. MNL-15, Field Reference Manual

B. American Society for Testing and Materials (ASTM)
1. ASTM C31, Standard Method of Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33, Standard Specification for Concrete Aggregates.
3. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94, Standard Specification for Ready-Mixed Concrete.
6. ASTM C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
7. ASTM C143, Standard Test Method for Slump of Portland Cement Concrete.
8. ASTM C150, Standard Specification for Portland Cement.
9. ASTM C156, Standard Test Method for Water Retention by Concrete Curing Materials.
10. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C172, Standard Method of Sampling Fresh Concrete.
12. ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C260, Standard Specification for Air- Entraining Admixtures for Concrete.
15. ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
17. ASTM C494, Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C567, Test for Unit Weight of Structural Lightweight Concrete.
19. ASTM C618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
20. ASTM C989, Standard Specification for Slag Cement for Use in Concrete and Mortars.

21. ASTM C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
22. ASTM C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
23. ASTM C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
24. ASTM C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
25. ASTM C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
26. ASTM E1155, Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound) Units.
27. ASTM E1745, Standard Specification for Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

C. Corps of Engineers (CRD)
1. CRD-C13, Standard Specification for Air- Entraining Admixtures for Concrete.
2. CRD-C572, Specifications for Polyvinyl Chloride Water Stops.
3. CRD-C621, Corps of Engineers Specification for Non-Shrink Grout.

1.3 SUBMITTALS

A. Product Data: submit manufacturer’s data indicating product compliance for the following:
1. Admixtures
2. Floor hardener
3. Curing compound
4. Curing and Sealing compound
5. Vapor Retarder
6. Waterstops
7. Non-shrink grout

B. Material Certifications: submit certifications showing compliance for the following:
1. Portland cement
2. Fly ash
3. Slag cement
4. Sieve analyses for structural concrete aggregates:
   a. Coarse aggregate
   b. Fine aggregate

C. Structural Concrete Mix Designs for each class of concrete

D. Concrete Delivery Tickets: Submit sample ready-mixed concrete delivery tickets in accordance with ASTM C94 for each class of concrete.

E. Construction Joints: submit drawings indicating proposed construction join locations.

F. Unless otherwise indicated, submit the following for each type of product provided under Work of this Section:
1. Product Disclosure:
   a. If available, provide product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which product manufacturer is explicitly recognized as a participant by program operator.
   b. If available, provide third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of product contents.
   c. If available, provide published Health Product Declaration (HPD) for each product documenting role, amount, and health hazards for every product ingredient.
2. Recycled Content:
   a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   b. Indicate material cost of product less labor included in Project.
   c. If recycled content is part of an assembly, indicate percentage of pre-consumer and post-consumer recycled contents in assembly by weight.
3. Local / Regional Materials:

a. Indicate extraction, manufacture, and purchase location of products; indicate distance between points of extraction, manufacture, and purchase and Project site.
b. Indicate material cost less labor of products extracted, manufactured, and purchased within 100 miles of Project site.

1.4 QUALITY ASSURANCE

A. Batch Plant Qualifications: Conform to National Ready-Mixed Concrete Association certification requirements.

1.5 DELIVERY, STORAGE AND HANDLING

A. Transporting: Ready-mixed concrete supplier to have sufficient capacity and adequate facilities to provide continuous delivery at rate required for continuous placement throughout sequence of placement.

B. Storage of Materials
1. Store cement in weather tight buildings or bins which prevent intrusion of moisture or contaminants. Store different types of cement in separate facilities.
2. Stockpile aggregates to prevent segregation and contamination with other materials. Thaw frozen aggregates before use.
3. Drain sand to uniform moisture content before use.
4. Store admixtures securely to prevent contamination, evaporation, damage or temperature variation in excess of range recommended by manufacturer.
5. Store waterstops under cover to prevent exposure to sunlight, moisture, soil and other deleterious materials.

C. Delivery: Truck mixers, agitators and non-agitating units: Conform to ASTM C94

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ardex Americas

B. Dayton Superior

C. Euclid Chemical Company

D. W.R. Grace & Company

E. SpecChem

F. BASF

G. W.R. Meadows

H. Sika Corporation

I. Sonneborn

2.2 MATERIALS

A. Cementitious materials
1. Portland cement: Conform to ASTM C150, Type I, II or III Portland Cement.
2. Fly Ash: Conform to ASTM C618, carbon content not greater than 3 percent by volume.
3. Slag Cement: Conform to ASTM C989.

B. Fine aggregate: Conform to ASTM C33, natural bank or river sand, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, and graded from coarse to fine to produce a minimum percentage of voids.

C. Coarse aggregate: Conform to ASTM C33, gravel or crushed stone, suitably processed, washed and screened; consisting of hard, durable particles without adherent coatings.

D. Water: Conform to ASTM C1602.

E. Admixtures: Conform to ASTM C494, Type A through G, and used strictly in accordance with manufacturer's recommendations.

F. Air Entraining Admixtures: Conform to ASTM C260 and CRD-C13.

G. Calcium chloride thiocyanates or admixture containing more than 0.05 percent chloride ions not permitted in concrete mixtures.

H. Admixtures containing chlorides not permitted in concrete poured on metal floor deck, nor in post-tensioned concrete.

2.3 CURING AND FINISHING PRODUCTS

A. Liquid Curing Compound
   1. Conform to ASTM C309, Types 1 and 1D, Class B
   2. Meet federal and state VOC/AIM regulations.
   3. Dissipating resin type, which chemically breaks down after approximately 8 weeks.
   4. Does not inhibit bonding of flooring adhesives.
   5. Does not inhibit bond breaker, where applicable.
   6. Sodium silicates prohibited.
   7. Use on interior slabs receiving subsequent floor coverings and parking structures.

B. Curing and Sealing Compounds:
   1. Conform to ASTM C1315, Type 1, Class A.
   2. Minimum 25 percent solids by volume.
   3. Moisture loss not more than 0.30 Kg/M2 when applied at 300 square feet per gallon.
   4. Meet federal and state VOC/AIM regulations
   5. Do not use in tilt-up construction

C. Evaporation Retardant:
   1. Thin, continuous film which prevents rapid moisture loss from concrete surface.
   2. Use in concrete operations performed in direct sun, wind, or high temperatures.

D. Waterproof Paper:
   1. Waterproof paper for curing concrete: 2 ply fiber-reinforced, asphaltic kraft paper conforming to ASTM C171.

E. Abrasive Aggregate: aluminum oxide aggregate

F. Floor Hardener:
   1. Penetrating liquid for subsequent application
   2. Non-staining
   3. Combination curing compound and hardener not permitted.

G. Cement Floor Leveling Compound: Free flowing, self-leveling, pumpable, cementitious compound specially formulated for feather-edge application.

H. Liquid Densifier / Sealer:
   1. Siliconate based sealer that penetrates concrete surfaces, increases abrasion resistance, and provides a "low sheen" surface.
   2. Clear, non-yellowing, fast curing, chemically neutral, without oils, fillers, extenders and stabilizers.

3. Does not inhibit bonding of flooring adhesives.
4. Does not inhibit bond breaker, where applicable.

I. Comply with applicable air-quality and environmental regulations.

2.4 MISCELLANEOUS PRODUCTS

A. Waterstops: shall be one of the following, or an approved equal, installed per manufacturer's recommendations
   1. Bulb type with minimum 3 inch ribbed extension into concrete each side of joint. One side shall be split for anchoring to formwork.
      a. Representative product: "Sealtight No. 6316", W.R. Meadows Co.
   2. Self-sealing non-swelling preformed joint sealant.
      a. Representative product: "SF302 Synko-Flex Waterstop", Henry Company
   3. Expanding preformed strip utilizing high sodium-bentonite content.
      a. Representative product: "Volclay Waterstop-RX, Model RX101", American Colloid Company

B. Non-Shrink Grout:
   1. Pre-mixed, non-shrinking, high strength grout
   2. Compressive strength in 28 days: 5000 psi minimum at 28 days, but not less than specified strength of base concrete.
   3. Conform to ASTM C1107 and CRD-C621.
   4. Non-oxidizing if permanently exposed to view
   5. Exhibits positive expansion when testing in accordance with ASTM C1090.
   6. Example products:
      a. Euco N-S Grout, manufactured by Euclid Chemical Co.
      b. Masterflow 713, manufactured by Master Builders Co.
      c. SikaGrout 212, manufactured by Sika Corporation.

2.5 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document product's environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document chemical inventory of product to at least 0.1 percent.

2.6 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below industry average in the following categories:
   1. Global warming potential
   2. Depletion of stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of pre-consumer recycled content constitutes at least 25 percent of total value of materials in Project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk programs.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products sourced within 100 miles of Project site.

2.7 CONCRETE MIXES

A. General: Compose concrete of cementitious materials, fine aggregate, coarse aggregate, water, and admixtures where applicable. Design concrete mixes to be workable and appropriate for each application, to bond readily to reinforcement, without segregation or formation of excessive free water on surfaces.

B. Strength Gain: design concrete mixes to obtain required strength in 28 days or less from date of placement.

C. Selection of Proportions
1. Determine ingredient proportions in accordance with ACI 301 to provide required strength, slump, resistance to weathering, placeability, durability and surface hardness for each class of concrete.
2. Provide admixtures as required or appropriate to enhance workability, control set or improve strength.
3. Minimum Cement Content: Cement content not less than 320 pounds per cubic yard
4. Supplementary cementitious materials (fly ash and slag cement)
   a. Percentage of supplementary cementitious materials not to exceed 25 percent of total cementitious content by weight
   b. Fly ash not permitted in architecturally exposed concrete
   c. Supplementary cementitious materials not permitted in concrete receiving dry shake floor hardeners

D. Required Average Strength for Mix Design:
1. Where suitable strength test records for concrete production facility are available, design strength may be based on standard deviation in accordance with ACI 301.
2. Where strength test records are not available, base design strength on the following:
3.
4. Specified Strength | Required Average Strength
5. F'c - psi | F'cr - psi
6. ---------- | ----------
7. F'c <3000 | F'c + 1000
8. 3000 <= F'c <=5000 | F'c + 1200
9. F'c > 5000 | 1.10 F'c + 700
10.

E. Documentation of Average Strength: provide evidence of average strength for each class of concrete in accordance with ACI 301 by field strength tests, strength test records or trial mixtures.

F. Concrete Mix Designs: submit mix designs for each class of concrete.
1. Indicate the following for each mix design:
   a. Class designation
   b. Proportions of cement, supplementary cementitious materials, fine and coarse aggregates, and water
   c. Water-cement ratio, design strength, slump, and air content
   d. Type of cement, supplementary cementitious materials and aggregates
   e. Type and dosage of admixtures
2. Adjust mix designs as required by weather and jobsite conditions to maintain specified strengths throughout course of Work without additional cost to Owner.
3. As strength data becomes available during progress of Work, mix designs may be adjusted in accordance with ACI 301.
4. Provide mix with target slump not to exceed 8 inches with no visible signs of segregation.

2.8 PRODUCTION OF CONCRETE

A. Do not mix concrete for placement until:
1. Mix designs and corresponding strength tests reflect that each proposed mix will develop strengths required

2. Mix designs have been reviewed for compliance.

B. Batching and Mixing:
1. Batch and mix ready-mixed concrete in accordance with ASTM C94.
2. Batch site-mixed concrete with scales accurate to within 0.4 percent of their total capacities. Consistently measure ingredients within 1 percent for concrete and water, 2 percent for aggregates and 3 percent for admixtures during operation of batching equipment. Mix site-batched concrete in accordance ACI 301.

C. Admixtures: Charge air-entraining admixtures and other chemical admixtures into mixer as solutions and accurately measure by means of a mechanical dispenser. Consider solution as part of mixing water.

2.9 SOURCE QUALITY CONTROL

A. Laboratory Inspection
1. Verify required plant certifications
2. Inspect batching equipment periodically
3. Inspect batching and loading of transit-mix trucks at start of each production day.

B. Materials Testing
1. Sieve analysis of aggregates

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not begin delivery of concrete materials until formwork, reinforcement, and embedded items are complete, properly positioned and secured in place.
1. Remove snow, ice, debris and excessive water from forms.
2. Pre-wet soil and sand subgrades and surfaces of precast concrete to receive fresh concrete.
3. Position and secure expansion joint materials, anchors, waterstops, screeds, control joint forms, and expansion caps on slip-dowels.
4. Remove hardened concrete and foreign materials from inner surfaces of conveying equipment, formwork and reinforcing.

B. Prepare and have ready in good working condition chutes, tremies, pumps, buggies, vibrators and other equipment necessary for orderly and continuous concrete placement.

C. Where carton-form void forms are used, inspect condition before placing concrete. Replace crushed or weakened boxes and tape joints. Repair sides of grade beam and wall excavations so that not more than 3 inches of ground is visible beyond void box edges.

D. Inspect and repair vapor barrier where applicable.

3.2 INSTALLATION

A. Conveying:
1. Prevent separation, segregation and loss of ingredients.
2. Convey concrete from mixer to place of final deposit as rapidly as possible.
3. Take special precautions with belt conveyors to prevent segregation of ingredients, drying and rise in temperature during conveying.
4. Use pumps or pneumatic equipment with adequate pumping capacity. Do not exceed 2 inches of slump loss due to pumping. Do not convey concrete through pipes made of aluminum or aluminum alloy.
5. Thoroughly clean conveying equipment at end of each placement sequence.

B. Depositing:
1. Place concrete continuously in horizontal layers not more than 12 inches deep. Exercise care to avoid seams or weakened planes within concrete. Deposit concrete into, not away from, previously deposited concrete.

2. Do not place fresh concrete against concrete that would result in cold joints.
3. Do not place concrete which has partially set or that contains foreign material.
4. Avoid splashing forms and reinforcing with concrete.
5. Place concrete in forms as near as practicable to final position. Do not transport concrete in forms with vibrators or screeds.
6. Do not drop concrete directly into standing water. Use a tremie with outlet near bottom of place of deposit.
7. Use tremies, chutes or hoppers to place concrete where a vertical drop greater than 5 feet is required.
8. Do not place concrete when slump tests indicate plasticity greater than required limits.
9. Continuously monitor condition of void box forms during placement of concrete. Avoid piling concrete on void forms. Replace void boxes that partially or wholly collapse under weight of concrete.
10. Indiscriminate addition of water to increase slump is prohibited. When concrete arrives at jobsite with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded.

C. Consolidating:
1. Conform to ACI 309
2. As soon as concrete is deposited, thoroughly agitate by means of mechanical vibrators and suitable hand tools, to work mixture well into parts and corners of forms, and entirely around reinforcement and inserts.
3. Use mechanical vibrators with minimum frequency of 7000 revolutions per minute.
4. Do not over-vibrate concrete or use vibrators to transport concrete within forms. Insert vibrators vertically at frequent intervals, do not drag vibrators through concrete.
5. Do not insert vibrators into lower courses that have begun to set.
6. Maintain spare vibrators on job site during concrete placing operations.

D. Placement against hardened concrete:
1. Remove laitance and thoroughly clean and dampen surface of hardened concrete before placement of fresh concrete.
2. If bond is required, roughen surface in an acceptable manner that exposes coarse aggregate and does not leave laitance, loose aggregate particles, or damaged concrete at surface.
3.

3.3 APPLICATION

A. Construction Joints
1. Each unit of structure (beam, column, pier, footing, joist, slab or wall) to be monolithic in construction except where specifically required to be otherwise.
2. Where required, locate construction joints within middle third of span of conventionally reinforced beams, joists, and slabs. Coordinate construction joint locations in post-tensioned beams, joists, and slabs with post-tensioning supplier.
3. Locate construction joints only where shown in structural Contract Documents or approved submittals.

B. Weather Conditions:
1. Cold Weather:
   a. Conform to ACI 306, when average of highest and lowest ambient temperature in a 24-hour period is expected to be less than 40 degrees Fahrenheit for more than 3 successive days.
   b. Concrete mixture temperature can be adjusted by adding uniformly heated water and/or aggregates that conform to ACI requirements.
   c. Maintain temperature of deposited concrete between 50 degress Fahrenheit and 70 degrees Fahrenheit for a minimum of 7 days after placement.
   d. Clear surfaces to receive concrete and spaces to be filled with concrete of snow, ice, and standing water before placement.
   e. Discuss cold weather concreting methods with Architect prior to concrete placement.
2. Hot Weather:
   a. Conform to ACI 305, when ambient temperature is 80 degrees Fahrenheit or higher.
   b. Maximum allowable fresh concrete temperature is 95 degrees Fahrenheit, unless testing of concrete mixture at higher temperature has been submitted and approved by Architect.
   c. Concrete mixture temperature can be adjusted by adding chilled water, substituting portions of mixing water with chipped or shaved ice, or other methods that conform to ACI requirements.
   d. Control concrete surface bleed-water evaporation with application of evaporation reducers, plastic sheeting, fog spray, or wind breaks.

e. Discuss hot weather concreting methods with Architect prior to concrete placement.

C. Composite Concrete/Steel Construction
1. Do not place concrete until inspection and measuring requirements of structural steel, composite metal floor deck and field welded shear studs are complete.
2. Where concrete is to be placed on unshored steel beams, take care to prevent excessive deflection of beams during construction.
3. For beam spans greater than 40 feet, place concrete from center of beams, working towards both ends simultaneously.
4. Screed concrete slabs placed on unshored steel beams to required slab thickness above metal deck. Do not level.

D. Slab Thickness
1. Allowable deviation from cross sectional dimensions
a. Suspended slabs: minus ¼ inch
b. Slabs on ground:
1) Average of samples: minus 3/8 inch
2) Individual sample: minus ¾ inch

E. Slab Flatness and Levelness:
1. General: Gap under straightedge and between support points of a freestanding 10 foot straightedge conform to the following requirements:
a. For slabs on grade and level suspended slabs shored until after testing: plus or minus 1/4 inch in 10 feet in any direction, maximum 1 inch variation between columns, but not to exceed F_L and F_F limits below. Laser leveling of floor slab surface permitted.
b. For unshored suspended slabs: plus or minus 1/4 inch in 10 feet in any direction, but not to exceed F_F limits below. See Division 5 Sections for steel frame tolerances. Laser leveling of floor slab surface not permitted.
2. Definitions:
a. F_F - maximum variation in floor elevation within any 2-foot length; "flatness"
b. F_L - maximum variation in floor elevation between any 2 points separated by 10 feet; "levelness"
c. Specified Overall Value - minimum average for Project
d. Minimum Local Value - minimum within each column bay
3. Slab flatness and levelness measurements:
a. Measure where requested by Owner or Architect, at Owner's expense.
b. Measure in accordance with ASTM E1155 and ACI 117.
c. Required minimum flatness and levelness values:
1) Typical, UNO
a) Slab-on-Grade
I) Specified Overall Value – F_F 25 / F_L 20
II) Minimum Local Value – F_F 17 / F_L 15
b) Level Suspended Slabs Shored Until After Testing
I) Specified Overall Value – F_F 25 / F_L 20
II) Minimum Local Value – F_F 17 / F_L 15
c) Unshored Suspended Slabs
I) Specified Overall Value – F_F 25
II) Minimum Local Value – F_F 17

3.4 FINISHING EXPOSED CONCRETE SURFACES

A. General
1. Conform to ACI 302.1.
2. Double screed slabs at required elevations.
3. Provide camber as required.
4. Apply finishing products and cure in accordance with manufacturers' recommendations.

B. Slab Surfaces
1. Scratch Finish
a. Locations

1) Surfaces receiving topping slabs
2) Final finish where topping slabs, waterproofing membrane or roofing is placed over finished surface.

b. Method: Place, consolidate, strike off, and level concrete. Cut high spots and fill low spots. Roughen surface with stiff brushes or rakes before concrete becomes too stiff to brush or rake.

2. Float finish
   a. Locations -Walks, steps, and surfaces receiving waterproofing, roofing, insulation, or sand-bed terrazzo.
   b. Method – Place, consolidate, strike off, and level concrete. Cut high spots and fill low spots. Do not perform further finishing operations until concrete is ready for floating. Floating with hand float, bladed power float equipped with float shoes, or powered disk float. Begin floating when bleed water sheen has disappeared and surface has stiffened sufficiently to permit operation of selected float apparatus. Unless otherwise specified, produce finish that will meet tolerance requirements of ACI 117 for conventional surfaces.
3. Trowel Finish
   a. Locations – Interior floors.
   b. Method: Float then trowel concrete surface. Unless otherwise specified, conform to tolerances for a flat surface in accordance with ACI 117. Addition of water to surface to facilitate finishing is prohibited. Do not apply hard-troweled finish to concrete with total air content greater than 3 percent.
4. Broom or belt finish:
   a. Locations: For parking slabs and exterior surfaces including slabs, ramps, walkways, and steps.
   b. Method: After concrete has received float finish, give concrete surface a coarse-scored texture by drawing a broom or burlap belt across surface.
   c. Provide mockup of concrete finish for Architect and Owner approval.
5. Dry-shake finish
   a. Locations: Where specified.
   b. Method: If specified, blend metallic or mineral aggregate with Portland cement in proportions recommended by aggregate manufacturer. Ensure finishing operations do not seal surface before end of bleeding to minimize potential of delamination or blistering. Float-finish concrete surface. Make initial application of dry material by mechanical spreader or by broadcasting with shovels. Begin final floating after final dry-shake application. Following floating, provide hard-troweled finish. Alternatively, if specified in Contract Documents, use bagged, premixed material applied in accordance with manufacturers recommendations.
   c. Provide mockup of concrete finish for Architect and Owner approval.
6. Nonslip finish
   a. Locations: Interior pan type stair treads and platforms, exterior concrete stair treads, ramps, and where specified in Contract Documents.
   b. Method: Broom or belt finish, or dry-shake finish
      1) For dry-shake finish, give surface a dry-shake application of crushed aluminum oxide, at a rate of at least 25 pounds per 100 square feet, unless otherwise specified.
   c. Provide mockup of concrete finish for Architect and Owner approval.
   d.

C. Saw-Cutting Concrete Slabs-on-Grade
   1. Saw joints as soon as possible after finishing, but only after concrete is hard enough. Concrete is hard enough when saw blade does not dislodge aggregate and when edges of sawcut do not ravel.
   2. Provide joints a minimum of 1/4 inch wide and 1/4 of slab thickness deep unless noted otherwise in Contract Documents.
   3. Formed strips may be used in lieu of saw-cutting in same locations and to equal depth as sawn joints.

D. Formed Surfaces
   1. General: Solidly fill holes resulting from removal of bolts or tie rods with cement grout. Fill holes passing entirely through concrete members from inside face with a plunger-type grease gun or other device to force grout through to outside face.
   2. Rough Form Finish
      a. Locations: For surfaces not exposed to view.
      b. Remove fins exceeding 1/4 inch in height, and grind bulges that interfere with other trades.
      c. Fill holes and honeycombs.
   3. Smooth Form Finish
      a. Locations: For surfaces exposed to view.
      b. Remove fins, bulges and unsightly form marks.

c. Fill holes and honeycombs to match surrounding concrete surfaces.
d. Provide rubbed finish where satisfactory form finish cannot be achieved.

4. Rubbed Finish
   a. Locations: For surfaces exposed to view.
   b. Apply finish as soon as possible after casting concrete, no later than one day following form removal.
   c. Wet surface and rub with carborundum brick or other abrasive to produce uniform color and texture.
   d. Patch and dress form tie holes and honeycombs to match color and texture of surrounding concrete.

3.5 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical damage. Conform to ACI 308.

B. Protect surfaces not in contact with forms from moisture loss with one of the following methods immediately after finishing and continuing for a period of at least 7 days:
   1. Ponding or continuous sprinkling
   2. Application of absorptive mats or fabric kept continuously wet
   3. Application of sand kept continuously wet
   4. Continuous application of steam or mist
   5. Application of waterproof sheet materials
   6. Application of curing compound in conformance with ASTM C309. Apply curing compounds in accordance with manufacturer's recommendations.
      a. Do not use curing compound on any surface against which additional concrete is to be placed or other material is to be bonded, unless it is proven that compound will not inhibit bonding, or positive measures are taken to completely remove compound from areas to received bonded materials.

C. Protect surfaces cast against forms from moisture loss by keeping forms wet until removed. After form removal, protect exposed surfaces from moisture loss by one of the methods specified for surfaces not in contact with forms

D. Continue curing for a period of 7 days for Type I cement, 3 days for Type III cement, or until tests indicate that concrete has attained 70 percent of required strength.

3.6 FIELD QUALITY CONTROL

A. Laboratory Testing and Inspection
   1. Concrete Compression Testing: Secure composite samples in accordance with ASTM C172. Take samples for strength tests of each mix design placed each day at the following intervals:
      a. not less than once daily,
      b. nor less than once for each 150 cubic yards of concrete,
      c. nor less than once for each 5,000 square feet of surface area for slabs or walls.
   2. Mold and cure specimens from each sample in accordance with ASTM C31. Test concrete specimens in accordance with ASTM C39. A single strength test consists of one of the following:
      a. Four 6 inch by 12 inch cylinders: one cylinder tested at 7 days, two cylinders tested at 28 days, one cylinder held in reserve if needed.
      b. Five 4 inch by 8 inch cylinders: one cylinder tested at 7 days, three cylinders tested at 28 days, one cylinder held in reserve if needed.
   3. Determine slump for each strength test and whenever consistency of concrete appears to vary, in accordance with ASTM C143. Ready mix trucks with Verifi Slump Management System, or approved equal, are permitted.
   4. Determine total air content of concrete sample for each strength test.
      a. Conform to ASTM C231 for normal weight concrete
      b. Conform to ASTM C138 or C173 for lightweight concrete.
   5. Determine concrete temperature by ASTM C1064 for each strength test.
   6. Inspection and Monitoring:
      a. Inspect concrete mixing and loading of transit-mix trucks at plant.
      b. Water additions during transit permitted in accordance with ASTM C94, with trucks equipped with automated slump and water management systems, such as Verifi Slump Management System.

c. Monitor addition of water to concrete at job site and length of time concrete is allowed to remain in truck during pour.
d. Certify each delivery ticket indicating class of concrete delivered or poured, amount of water added, time at which cement and aggregate were discharged into truck, and time at which concrete was discharged from truck.

B. Contractor's Responsibilities
1. Furnish necessary labor to assist testing agency in obtaining and handling samples at job-site.
2. Advise testing agency 24 hours in advance of operations to allow for assignment of testing personnel and testing.
3. Provide and maintain for use of testing agency adequate facilities for proper curing of concrete test specimens on project site in accordance with ASTM C31.

C. Evaluation and Acceptance:
1. Strength test is defined as the average of one of the following, made from the same concrete sample tested at 28 days or as determined by Architect:
a. Two 6 inch by 12 inch cylinders
b. Three 4 inch by 8 inch cylinders
2. Strength level of a given class of concrete will be considered satisfactory if each of the following requirements are met for that class of concrete:
a. Average of any three consecutive strength test results equals or exceeds specified strength.
b. No strength test result falls below specified strength by more than 500 psi when specified strength is 5,000 psi or less, or by more than 10 percent of specified strength when specified strength is greater than 5,000 psi.
3. Concrete strength tests made and tested by testing laboratory are sole criteria of concrete strength unless in-situ tests are made in accordance with Building Code by a qualified independent testing laboratory. Concrete for which strength tests do not meet criteria for acceptance is considered inadequate until proven otherwise.
4. Where strength tests fail to meet criteria specified herein, Architect is sole judge of structural adequacy of concrete.
a. Contractor responsible for burden of proof of structural adequacy. Strength evaluations conform to requirements of ACI 301.
b. If Architect determines, based on strength evaluation testing, that structure is of inadequate strength: repair or remove and replace portions of structure in question, as directed by Architect, at no additional expense to Owner.
c. If strength tests fall below specified strength, but not so low as to cause concern for structural adequacy, Architect may request improved conditions of curing or modification of design mixes to improve strength.

3.7 CLEANING AND REPAIR

A. Upon completion of work, perform the following cleaning and repair procedure:
1. Remove forms, equipment, protective coverings and resulting rubbish from premises.
2. Sweep with ordinary broom and remove mortar, concrete droppings, loose dirt, and mud.
3. Wash concrete floors and platforms with soapsuds and scrub with steel fiber brush.
4. Mop up suds and flush surfaces with clean water.
a. Provide adequate measures during scrubbing, mopping, and flushing operations to keep excessive or injurious amounts of water off floors.
5. Promptly, effectively and satisfactorily repair any damage occasioned to such floors by or on account of such operations.
6. Leave finished concrete surfaces in clean condition.

B. Remove concrete not required by Contract Documents caused by overpour, bulging or collapse of forms or error in form construction.

END OF SECTION

SECTION 04 20 00

MASONRY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Unit masonry construction.

B. Related Requirements:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 03 11 00 - Concrete Forming and Accessories: dovetail anchor slots.
3. Section 05 50 00 - Metal Fabrications: steel lintels.
4. Section 07 65 00 - Flexible Flashing: through-wall flashing and damproofing for masonry walls.
5. Section 07 21 00 - Building Insulation: continuous insulation.
6. Section 07 92 00 - Joint Sealants.
7. Section 08 11 00 - Hollow Metal Doors and Frames: installation of steel frames.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit for each type of product indicated.
1. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

C. Samples: Within 60 days after the contract has been awarded, submit manufacturer's standard sample panel showing full range of color, approximately 12" x 24" for each color and size of brick required.

D. Test Reports: Manufacturer of the concrete masonry units shall submit:
1. Certified test reports showing that the units to be furnished meet the requirements of ASTM C 90 and C 129, and have the required minimum compressive strengths.
2. Reports certifying concrete masonry units meet or exceed each of the fire-resistive ratings.

E. Provide a diagram of proposed control joints and expansion joints.

F. Submit steel reinforcing shop drawings for load-bearing concrete masonry unit walls, including elevations showing reinforcing, control joints, bond beams, dimensions and details.

G. Mortar Mixture Proportions: ASTM C 270, Submit copies of each proposed mix design for review prior to starting masonry work.

H. Grout Mixture Proportions: ASTM C 476, Submit copies of each proposed mix design for review prior to grout placement.
1. Include recent historical grout cylinder strength test reports for each mix design.

I. Pre-blended Mortar and Grout Certificates: Submit manufacturer’s certificates that products meet or exceed specified requirements.
1. Mortar: Submit test reports, per ASTM C 780, for each mortar mix indicating strength of mortar mixes. Submit computer batch-ticket to confirm the mixes meet the project SPEC MIX specifications for every bag of mortar.
2. Grout: Submit test reports, per ASTM C1019, for each grout mix indicating compressive strengths. Submit computer batch-ticket to confirm the grout mixes meet the project SPEC MIX specifications for every bag of grout**.**

1.3 QUALITY ASSURANCE

A. Manufacturer: Manufacturer shall have a minimum of five years’ experience manufacturing the specified product.

B. Installer: Masonry contractor shall have a minimum of five years' experience in similar types of work and be able to furnish a list of previous jobs and references if requested by the Architect.

C. Pre-installation Conference: Contractor shall schedule pre-installation conference at the project site with Architect/Engineer and Owner's Testing Lab. Conference shall be held prior to proceeding with masonry work and shall comply with requirements in Division 01 Section "Project Management and Coordination".

D. Expansion Joints (Control Joints): Provide expansion joints as shown on the Drawings or if not shown, install at frequency and in accordance with details as recommended by the N.C.M.A. or B.I.A. Confirm locations and frequency with Architect before beginning work. Refer to expansion joint Paragraph in the Installation portion of this specification section.

E. Mock-up: Construct a sample wall panel at the site using brick veneer, monumental CMU, burnished CMU, mortar, and masonry backup proposed for the project. The panel shall duplicate the typical building wall construction (coursing, bonding, joint treatment, sealant, cleaning methods and materials as required in SECTION 07 92 00 - JOINT SEALANTS). Sample panel shall be fully acceptable to the Architect prior to ordering of materials. Install one vertical 3/8" control joint for full height of panel. Panel shall be not less than 4 ft. by 3 ft. Construct panel on a wood pallet, providing portability around the project site. Do not alter nor destroy mock-up until attainment of Substantial Completion. Approved mock-up panel shall be the standard of comparison for workmanship and materials.

F. Fire-resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Brick Delivery: Do not lay face brick until at least 50% of the brick for the project has been delivered. As brick work progresses, make additional deliveries of brick so that at all times at least 50% of the remaining brick requirements are on the project site. Serve masons brick intermixed from the various storage piles to assure blending of brick.

B. Store face brick and masonry units above ground on wood pallets which allow air circulation under the stacked units.

1.5 PROJECT CONDITIONS

A. Refer to "Protection" Paragraph for daily activities.

B. Cold Weather Construction: Do no masonry work when freezing weather is expected. If Contractor elects to lay masonry when air temperature falls or is expected to fall below 40°F., provide construction means and protection of completed masonry as described in BIA Technical Note 1A Cold Weather Masonry Construction -- Construction and Protection Recommendations.
   1. The use of admixtures or antifreezes to lower the freezing point of mortar shall not be permitted.

C. In hot weather (above 99°F. with less than 50% relative humidity) protect masonry construction from direct exposure to sun and wind.

D. Temporary Bracing: Take adequate precautions to prevent damage to walls during erection by high winds or other forces. Where necessary, provide temporary bracing until the designed lateral strength is reached.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Brick Veneer: ASTM C 216 face brick or ASTM C 652 hollow brick.
   1. Face Brick: ASTM C 216, Grade SW, Type FBS, face brick.
   2. Hollow Brick: ASTM C 652, Grade SW, Class H40V, Type HBS, hollow brick with 3/4" minimum shell thickness on outer face shell, inner face shell, and end webs.
   3. Brick Veneer-Bryson Elementary School: Modular size face brick or hollow brick with actual dimensions of 2-1/4" x 3-5/8" x 7-5/8". Provide mixture of “Copper Sand” and “Iron Stone” as manufactured by Acme Brick. Manufacturer's identification on brick will not be acceptable.

B. Special Brick Shapes: Provide special shapes and sizes of face brick and glazed brick as required for a complete project. Exposed surfaces to match the face brick in color, texture, and blend. Special shapes and sizes shall include, but not be limited to, the following:
   1. Solid bricks at soldier bond corners
   2. Two-faced brick at corners, windows, and doors.

C. Common Brick: ASTM C 62, Grade MW, hard-burned stiff mud or dry-pressed brick. Use common brick where concealed brick is required.

D. Concrete Masonry Units: ASTM C 90, Grade N-I, moisture controlled, for load-bearing units; ASTM C 129, moisture controlled, Type I, for non-load-bearing units. Provide hollow units made from Portland cement and lightweight mineral aggregate.
   1. All units shall be from the same manufacturing plant and shall have the same surface texture.
   2. Use load-bearing units for exterior wall backup and load-bearing partitions, non-load-bearing units elsewhere.
   3. Provide 1" bullnose units at exposed outside corners and jambs and as noted on drawings.
      a. Provide square edge starter course corners at all rubber base conditions where preformed base corners are specified to be provided.
      b. Provide square edges at all furred units and units to be covered with ceramic tile.
   4. Provide sash block control joints at concrete block walls with pre-molded rubber control joint filler.
   5. Provide 5" starter blocks where required. Nominal Size: 8" x 16" face.
   6. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
   7. Provide “equivalent concrete masonry thickness” required for fire-rated assemblies where required.

E. Related Materials:
   1. Bond Breaker: ASTM D 226, Type I (No. 15), non-perforated asphalt-saturated felt.

2.2 REINFORCING AND TIES

A. Wall Ties: ASTM A153
   1. For Brick Veneer at CFS: Provide adjustable veneer anchors consisting of 14 gage, ASTM A580, stainless steel screw-on backplates and holes at top and bottom with legs in length as required to accommodate insulation thickness as shown on drawings and specified in Section 07 2100 - Building Insulation. Also provide stainless steel ties/pintles of 3/16" diameter, with pintle length as required.. Product/manufacturer; one of the following:
      213 with 282; Heckman Building Products, Inc.
      HB-213 with 2X Hook; Hohmann & Barnard, Inc.
      2401 (RJ-711) with 242 Hook; Wire-Bond (Masonry Reinforcing Corp. of America)
   2. For Brick Veneer at CMU: Provide adjustable veneer anchors consisting of 14 gage, ASTM A580, stainless steel screw-on backplates and holes at top and bottom with legs in length as required to accommodate insulation thickness as shown on drawings and specified in Section 07 2100 - Building Insulation. Also provide stainless steel ties/pintles of 3/16" diameter, with pintle length as required.. Product/manufacturer; one of the following:
      213 with 282; Heckman Building Products, Inc.
      HB-5213 with 2X Hook; Hohmann & Barnard, Inc.
      2401 (RJ-711) with 242 Hook; Wire-Bond (Masonry Reinforcing Corp. of America)

B. Triangular Ties and Column Anchors: ASTM A 82 hot dip galvanized steel wire, 3/16" diameter ties and 1/4" diameter anchors, for tying masonry walls to steel columns.

C. Dovetail Anchors: 16 gage hot dip galvanized corrugated steel ties 1" wide x 4 1/2" long.

D. Joint Reinforcement at Single-wythe Concrete Masonry Unit: Provide truss type with continuous 9 gage diagonal cross rods spaced not more than 16" o.c., unless smaller spacing is shown on the drawings. Product/manufacturer; one of the following:
   #120 Truss-Mesh; Hohmann & Barnard, Inc.
   Series 300; Wire-Bond
   1. Finish shall be Class 1 mill galvanized.
   2. Corners and tees shall be prefabricated.

E. Reinforcing Steel: ASTM A 615, Grade 60, deformed billet steel.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, domestic manufacture.
   1. Provide white Portland cement for colored mortar.
   2. Provide natural Portland cement for other masonry.

B. Lime: ASTM C 207, Type S, with not more than 8% unhydrated oxides.

C. Aggregate for Mortar; Sand: ASTM C 144, well-graded natural sand. Provide white or light color sand for colored mortar and white mortar.

D. Aggregate for Grout: ASTM C 404.

E. Coloring Pigment: Mortar color(s) as selected by Architect to match existing. Provide coloring pigment as manufactured by Lambert Southwest, Inc., (phone 903.657.4680 web site: www.lambertsw.com) or Solomon Colors (phone 800.624.0261 web site www.solomoncolors.com).

F. Water: Clean and free of deleterious amounts of acids, alkalis, or organic materials.

G. Water-repellent Admixture: Provide same integral liquid polymeric water repellent admixture used in burnished concrete masonry units for mortar used in laying burnished concrete masonry units.

2.4 MORTAR; FIELD PREPARED

A. Mix proportions: ASTM C 270, mortar proportions by volume:
   1. Type N Mortar - Exterior and Interior at masonry veneer construction:
      1 part Portland cement
      1 part lime
      6 parts sand
      Coloring Pigment: Add coloring pigment at manufacturer's recommended rate to obtain colors as selected by Architect. No mortar color is required at concealed or painted masonry.
   2. Type M Mortar - Exterior masonry veneer construction below grade or in contact with earth:
      1 part Portland cement
      1/4 part lime
      3-3/4 parts sand
   3. Type S Mortar - Exterior and Interior at load-bearing and non-load-bearing concrete masonry unit walls:
      1 part Portland cement
      1/2 part lime
      4-1/2 parts sand
      Coloring Pigment: Add coloring pigment at manufacturer's recommended rate to obtain colors as selected by Architect. No mortar color is required at concealed or painted masonry.
   4. Bedding Mortar:
      1 part Portland cement
      1/7 part lime
      3 parts sand

B. Mixing:
1. All dry material shall be accurately measured in a leak-proof batching box. Contractor shall have the option of using a pre-manufactured cubic foot batching box or fabricating a wood box for measuring dry materials by volume. Box may be a convenient size, but shall be not less than 12" x 12" x 12" inside dimensions. The use of shovels for measuring dry materials is strictly prohibited.
2. Proportion mortar accurately and mix thoroughly with the maximum amount of water to produce a workable consistency for at least 5 minutes in a mechanical batch mixer. Keep tools and mixing equipment clean.
3. Do not use mortar which has begun to set, or if more than 2½ hours have elapsed since initial mixing. Do not re-temper mortar.
4. Mortar for Burnished Concrete Masonry Units: Add water repellent admixture at manufacturer's recommended rates to ensure mortar will be permanently water repellent**.**

C. Use: Lay exterior and interior masonry veneer construction using Type N mortar. Lay exterior masonry veneer below grade or in contact with earth using Type M mortar. Lay exterior and interior load-bearing masonry using Type S mortar. Where required use bedding mortar to set and fill hollow metal frames.

D. Masonry cement is not acceptable for mortar.

E. Do not use calcium chloride in mortar.

F. Pre-mix, dry or wet, is not acceptable for mortar, except as listed below; i.e. no other pre-mix mortars are acceptable.

2.5 MORTAR; PRE-BLENDED MORTAR MIXES, COLORED MORTAR MIXES, AND INTEGRAL WATER REPELLENT MORTAR MIXES

A. Contractor's Option: Provide pre-blended mortar mix, colored mortar mix, and integral water repellent mortar mix as manufactured by SPEC MIX, Inc. (phone 888.773.2649 web site: www.specmix.com), instead of field-prepared mortars. SPEC MIX pre-blended mortar option shall include manufacturer's standard silo system for mixing and delivery of mortar mixes.
1. Equivalent products by Quikrete Cement and Concrete Products–Dallas (800.627.6125) will be considered acceptable.
2. Pre-blended mortar mixes shall be mixed with potable water in strict compliance with manufacturer's written instructions and recommendations.
3. Masonry cement is not acceptable for pre-blended mortar.

B. SPEC MIX PCL Sand Pre-blended Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime and sand aggregate mixtures.
2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

C. SPEC MIX PCL Sand Pre-blended Colored Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime, sand aggregate, and color pigments.
2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

D. SPEC MIX PCL Sand Pre-blended IWR Colored Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime, sand aggregate, color pigments, and incorporating dry SPEC MIX Integral Water-repellent Mortar Admixture.
2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

E. Mixing: Mix mortar using manufacturer's standard mechanical mixer to ensure homogeneity and workability. Observe mixing times of 4-5 minutes, consistent from batch to batch. Use clean, potable water; add the maximum amount consistent with optimum workability.
1. At the end of the day, thoroughly rinse the mixer to avoid contamination of future mortar batches.
2. Discard mortar 2.5 hours after initial mixing.

2.6 GROUT; FIELD PREPARED

A. Grout shall conform to ASTM C 476. Provide grout for bond beams, masonry lintels, and reinforced masonry.
   1. Fine Grout Proportions:
      1 part Portland cement
      1/10 part lime
      3 parts fine aggregate
   2. Coarse Grout Proportions
      1 part Portland cement
      1/10 part lime
      3 parts fine aggregate
      2 parts coarse aggregate

B. When placing grout in masonry, exercise extreme care to prevent grout from staining face of masonry.

2.7 GROUT; PRE-BLENDED

A. Contractor's Option: Provide pre-blended grout mix as manufactured by SPEC MIX, Inc. (phone 888.773.2649 web site: www.specmix.com), instead of field-prepared grouts. SPEC MIX pre-blended grout option shall include manufacturer's standard silo system for mixing and delivery of grout mixes.
   1. Equivalent products by Quikrete Cement and Concrete Products–Dallas (800.627.6125) will be considered acceptable.
   2. Pre-blended grout mixes shall be mixed with potable water in strict compliance with manufacturer's written instructions and recommendations.

B. SPEC MIX Core Fill Masonry Grout:
   1. Material: Pre-blended factory mix of cementitious materials and dried aggregates meeting ASTM C 476 requirements for reinforced masonry construction.
   2. SPEC MIX Core Fill - Fine Grout: Pre-blended mix containing cementitious materials and fine aggregate designed to fill masonry voids two inches or less.
   3. SPEC MIX Core Fill - Course Grout: Pre-blended mix containing cementitious materials and coarse aggregate designed to fill masonry voids greater than two inches.

C. Mixing: Mix grout using manufacturer's standard mechanical mixer to ensure homogeneity and workability. Observe mixing time of 5 minutes, consistent from batch to batch. Use clean, potable water; add the maximum amount consistent with optimum workability.
   1. Discard unused grout 1.5 hours after initial mixing.

2.8 BRICK CLEANER

A. Use "Sure-Klean Vana Trol" as manufactured by ProSoCo, Inc., or an approved equivalent inorganic commercial masonry surface cleaner. "Sure Klean 600" may be used at concrete masonry units which are not adjacent to colored mortar and concrete masonry units which are scheduled to be painted.

2.9 ACCESSORIES

A. Control Joints: Preformed rubber material; RS Series Rubber Control Joint as manufactured by Hohmann & Barnard, Inc. or comparable products by Heckman. Width slightly less than wall thickness to allow for sealant material.

B. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

C. Cellular Plastic Weeps: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8" less than depth of outer wythe. Product/manufacturer; one of the following:
   Mortar Maze weep vent; Advanced Building Products Inc.
   No. 85 Cell Vent; Heckmann Building Products Inc.
   Quadro-Vent; Hohmann & Barnard, Inc.
   Cell Vent; Wire-Bond

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the cavity. Provide strips, full-depth of cavity, 10 inches high, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings. Provide single thickness 2" material at 1-3/4" to 2" wide masonry cavities. Product/manufacturer; Mortar Net™ with Insect Barrier, Mortar Net USA, Ltd. (phone 800.664.6638 web site: www.mortarnet.com).

E. Single-Wythe CMU: Provide "BlockFlash" as manufactured by Mortar Net USA, Ltd. CMU cell flashing pans with built-in adjoining bridge made from recycled polypropylene with chemical stabilizers that prevent UV degradation. Flashing pans have a sloped design to direct moisture to the integrated weep spout. Designed to be built into mortar bed joints to expel moisture (unimpeded by mortar droppings) to the exterior of CMU walls.

F. Rebar Positioners: Size and type required to accurately place reinforcing steel in bond beams, concrete masonry unit lintels, and vertically in walls.

G. Joint Stabilization Anchors: Mill-galvanized. Product/manufacturer:
Slip-set Stabilizer; Hohmann and Barnard

PART 3 - EXECUTION

3.1 PREPARATION

A. Wetting of Face Brick:
1. Draw a 1" circle with wax crayon on the bed surface of dry brick. Using medicine dropper, place 20 drops of water inside circle and measure time required for absorption of water.
2. If water is absorbed in less than 11/2 minutes, brick must be wet before being laid.
3. Brick shall have no visible moisture when laid.

B. Cleaning: Beams, slabs, and lintels on which masonry walls and partitions are to be laid shall be brushed thoroughly to remove loose dirt and laitance.

3.2 INSTALLATION

A. Installation Tolerances:
1. Maximum Variation from Plumb:
   a. Vertical lines and surfaces of columns and walls:
      1) 1/4" in 10'-0".
      2) 3/8" in any story or 20'-0" maximum.
      3) 1/2" in 40'-0".
   b. External Corners or Control Joints:
      1) 1/4" in any one story or 20'-0" maximum.
      2) 1/2" in 40'-0".
2. Maximum Variation from Unit to Adjacent Unit: 1/32" maximum. Maximum variation is mandatory on walls where only one surface is exposed. Where two surfaces are exposed to view, the more prominent face, per Architect, is to have maximum variation maintained, with the less prominent face allowed to exceed the maximum tolerance.
3. Maximum Variation from Level or Grades for Exposed Lintels, Sill, Parapets, or Horizontal Grooves:
   a. 1/4" in any bay or 20'-0" maximum.
   b. 1/2" in 40'-0".
4. Maximum Variation from Plan Location or Linear Building Line or Related Portions of Columns, Walls, and Partitions:
   a. 1/2" in any bay or 20'-0" maximum.
   b. 3/4" in 40'-0".
5. Maximum Variation in Cross-sectional Dimension of Columns and Thickness of Walls: ±1/4.
6. Maximum Variation in Mortar Joint Thickness:
   a. Bed Joint: ±1/8".
   b. Head Joint: ±1/8".

B. Dimensions are based on modular units except for special details. If units other than modular units are used, there shall be no change in story heights or other main dimensions of partition centerlines, and connecting work shall be adjusted to changes in unit sizes.

C. Laying Brick: Lay brick level, plumb, straight, and true to line within tolerances specified above. Spread the mortar bed full width and relatively smooth. Do not furrow. Butter the end of each brick with mortar and shove into place to completely fill the head joint. Do not feather the brick with excess mortar cut from the bed.
   1. At concrete foundations and beams, install bond breaker between first course of brick veneer and concrete bearing. Gaskets at bottom of cavity walls shall not be used as bond breakers unless gasket occurs under the first course of brick.
   2. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units to provide patterns shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Remove cut misfits and replace with properly cut units.
   3. Lay brick with special coursing and jointing as detailed. Lay rowlock and soldier courses with uniform joints approximately 3/8" wide. Use uncored brick for the exposed ends of such courses and wherever the holes would be exposed.
   4. When laying walls, keep the air space free and clear of mortar droppings and debris.
   5. Unless shown otherwise, provide vertical control joints every 40'.
   6. Refer to Expansion Joint Paragraph for Expansion Joints (Control Joints).

D. Laying Concrete Masonry Units: Spread mortar beds smooth and full to cover bearing areas. Do not furrow. Butter head joints and shove units into place. Head joints shall be staggered except where stack bond is specifically indicated. Make back joints full against the backing materials as each course is laid.
   1. Leave pipe spaces open on one full side until pipe work has been completed and inspected.
   2. Lay concrete masonry walls and partitions level, plumb, straight, and true to line within tolerances specified above.
   3. Fill the cells of exposed concrete masonry units with grout for a width of 8" at the jambs of openings in exterior walls.
   4. Exposed ends of units at external corners shall be solid.
   5. Units shown to be laid in stack bond shall be laid with such accuracy that a plumb line centered on a vertical joint in an upper course will be entirely within the width of the corresponding vertical joint in every lower course.
   6. Unless shown otherwise, provide vertical control joints every 40'.
   7. At sound absorbing concrete masonry units, provide slip-set stabilizer at 16" o.c., vertically,
   8. Maximum pour of grout in vertical cells shall be limited to 5'-0" unless cleanouts are provided at each cell.

E. Installation of Reinforced Unit Masonry:
   1. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
      a. Construct formwork to conform to shape, line, and dimensions shown. make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
      b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
   2. Set reinforcing in required position and secure against displacement before grouting is started. Cells requiring vertical reinforcement and grout shall be aligned to provide continuous unobstructed vertical opening. Place vertical reinforcing in cells with enough steel extending to provide proper lap splice. Horizontal steel shall be fully embedded in grout.
   3. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
      a. do not exceed the following pour heights for fine grout.
         1) For minimum widths of the grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
         2) For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
         3) For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.
         4) For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 24 feet.
      b. Do not exceed the following pour heights for coarse grout.
         1) For minimum widths of the grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
         2) For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
         3) For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.

4) For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

4. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height. Cleanouts shall be sealed after inspections before grouting.
   a. Provide cleanout holes at each vertical reinforcing bar.
5. Place grout in lifts not exceeding 5 feet.
6. Consolidate grout at the time of initial placement.
7. Grouting of a section of wall shall be completed within one day with no interruptions greater than one hour.

F. Reinforcing Masonry Joints: Reinforce the bed joints of concrete masonry unit walls and partitions with continuous joint reinforcement strips.
1. Furnish strips in long lengths. Width of strips shall be 2" less than nominal overall width of the wall or partition.
2. Lap strip ends 12" and bed side rods in mortar for complete cover and bond.
3. Install strips in bed joints spaced 16" o.c. for exterior walls and 24" o.c. for interior partitions, unless a smaller spacing is shown in the drawings. Reinforcement shall extend into and bond the facing wythe in walls.
4. At exterior masonry walls, discontinue horizontal joint reinforcement across control joints.
5. At interior masonry walls and intersection of interior/exterior masonry walls, continue horizontal joint reinforcement across control joints**.**

G. Bonding: Tie together masonry unit construction within walls and at intersections of walls by masonry bond and staggered vertical joints. Toothing will not be permitted except where specifically authorized by the Architect. Where walls must be built in advance of adjacent walls, form the stop-off by racking back.
1. Lay brick facing wythe in standard running bond with staggered head joints except where special coursing is indicated. Tie multiple wythe construction together with horizontal joint reinforcement and tab ties.
2. Where bond with joint reinforcement cannot be made, use wall ties spaced not more than 24" o.c. horizontally and vertically. Ties shall be laid in the joints, not shoved into wet mortar after setting the next course of masonry.
3. Tie brick veneer back to steel stud curtain walls with metal ties spaced 16" o.c. horizontally and 16" o.c. vertically. Around the perimeter of openings, edges, and tops and bottoms of walls, additional ties/anchors shall be installed at a maximum of 3 ft. o.c. within 12" of the opening. Secure ties through the sheathing to the studs with two screws and insert ties.
4. Tie masonry to structural steel columns by welding anchors to columns at 16" o.c. and inserting triangular ties. Ties shall be of the size required to extend within 2" of brick face.
5. Where concrete is faced more than 12" high with masonry, bond masonry to concrete with anchors set into dovetail anchor slots cast into the concrete. Provide the anchors. Spacing shall be as specified above for wall ties.
6. Bond interior masonry walls and the intersection of interior/exterior masonry walls by forming control joints and reinforce with horizontal reinforcing at 16" o.c.
7. Partitions between rooms without suspended ceilings, and 4" thick partitions with an unsupported length of more than 12 ft. shall be extended to the floor or roof above and wedged and sealed against it. Extend other partitions above the highest adjacent ceiling, unless indicated to extend up to floor or roof above.

H. Joints shall be 3/8" wide. Joints shall be straight and uniform.
1. Tool and work exposed joints to a hard, dense surface with a sled runner and leave without shrinkage cracks. Delay tooling until the mortar has set thumbprint hard. Tool the joints in masonry walls behind chalkboards and tackboards.
2. Rake out the joints to be caulked and keep them free of mortar as the work progresses.
3. Provide control joints at inside corners with backer rod and sealant.
4. Mortar color changes: Location of mortar color changes in relation to masonry color changes shall be as directed by Architect. Contractor shall rake and point mortar joints or otherwise alter standard masonry procedures to satisfy this requirement.

I. Masonry Bearings: Provide bearings of common brick under framing members which bear on masonry walls unless the members bear directly on concrete-filled bond beams.

J. Chases: Form chases and recesses to the required dimensions and lines, strike joints flush and remove excess mortar. Before closing chases and similar inaccessible spaces with masonry, remove rubbish and sweep out the area.

K. Lintels and Beams: Provide lintels and beams for openings in masonry walls. This includes lintels at masonry openings for ducts. Verify duct layouts on the mechanical drawings.
   1. Reinforced Masonry Lintels: Construct and reinforce masonry lintels where shown.
      a. Make concrete masonry lintel units of the same material and by the same process as the other concrete masonry units used in the building.
      b. Use trough-type units, not regular units with the web knocked out. Fill the troughs with grout.
      c. Build lintels in place where possible and cure at least 14 days before subjecting them to load. Provide at least 8" bearing at each jamb.
      d. Where reinforcing is not specifically called out for masonry lintels, use not less than a #4 bar top and bottom of 8" high masonry units for each 4" thickness of wall.
   2. Bond Beams: Provide bond beams in masonry walls. Bond beams shall be continuous where possible. Provide rebar positioners to accurately position reinforcing steel.
   3. Steel Lintels: Build steel lintels into the masonry walls. Where reinforcing or steel shapes are not specifically called out for lintels in brick walls, use one steel angle for each 4" thickness of brick in the wall.

L. Flashing:
   1. Build in flashings which enter the masonry, using the materials and following the instructions of the pertinent sections of the specifications.
   2. Create end dams at ends of window heads, at edges of storefronts, and other vertical elements to channel water to nearest weep hole away from window mullions and other items which might allow water to travel vertically.

M. Weeps: Install weep holes in veneer at 24" o.c. horizontally for clay masonry and 32" o.c. for 16" long concrete masonry, above through-wall flashing, above shelf angles, at bottom of walls, and at top of walls where noted. Install plastic weeps in strict accordance with manufacturer’s written instructions and recommendations.

N. Cavity Drainage Material: Install cavity drainage material in cavities to comply with manufacturer’s written instructions and recommendations. Provide single thickness 2” material at 1-3/4” to 2” wide masonry cavities. Provide one or more thicknesses as required to fill cavity width at other conditions. Install cavity drainage material with fabric facing to the exterior of the wall.

O. Expansion Joints (Control Joints):
   1. At exterior masonry walls, discontinue horizontal joint reinforcement across control joints.
   2. At interior masonry walls and intersection of interior/exterior masonry walls, continue horizontal joint reinforcement across control joints**.**
   3. Provide resilient continuous lengths of control joint material in concrete masonry unit sash blocks. Solvent weld butt and corner joints, in accordance with manufacturer's instructions.
   4. Size control joints in accordance with SECTION 07 92 00 - JOINT SEALANTS, for sealant performance, but in no case larger than adjacent mortar joints in exposed face brick.
   5. Interior control joints are not required to align with exterior control joints.
   6. Provide vertical expansion joints in masonry (concrete masonry unit and brick), as follows:
      a. Where shown on drawings.
      b. Horizontal expanse:
         1) Brick: 25’-0” max.
         2) Concrete Masonry Units: Not to exceed a length to height ratio of 1-1/2 : 1 or 25 ft., whichever is less.
         3) CMU not supported by a grade beam shall have control joints not to exceed 20’-0” O.C.
      c. Within 2'-0" of inside corners.
      d. Change of substrate including but not limited to the following:
         1) Concrete masonry unit to metal stud back-up.
         2) In masonry wall at intersection of concrete beam supported masonry and structural steel supported masonry.
         3) 5’ to 10’ maximum from transition from grade beam supported CMU to non-grade beam supported CMU.
      e. As recommended by referenced standards.
   7. Control joints shall extend continuous through bond beam although concrete and reinforcement for bond beam shall extend continuous through control joint.

P. Built-in Work:
   1. As work progresses, build-in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other sections.
   2. Build-in items plumb and level.

3. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with mortar minimum 8" from framed openings.
4. Do not build-in organic materials subject to deterioration.

Q. Cutting and Fitting:
1. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to provide correct size, shape, and location.
2. Obtain approval prior to cutting or fitting an area not indicated or where appearance or strength of masonry work may be impaired.

R. Miscellaneous Work:
1. Cooperate with other trades in installing their work in masonry. Furnish bedding mortar and set loose lintels. Cooperate in setting bucks and frames, maintain them in position and build them in with anchors properly placed. Do not distort frames by crowding.
2. Cut and form openings for recessed items and for electrical and plumbing installations so that wall plates and escutcheons will completely cover the openings. Cut edges shall be clean, sharp and straight.
3. Fill solid with mortar the spaces around and behind metal door frames.
4. Point with mortar the openings around flush-mounted electrical outlet boxes.

S. Sound-conditioned Masonry Walls: Fill cells of concrete masonry walls scheduled to be sound conditioned with grout.
1. Grouted masonry walls shall be covered with plastic sheeting secured with Hohmann & Barnard, Inc. Masonry Wall Clamp No. HB3000. Grout must be completely dry when wall is finished and enclosed.
2. At the end of each day's work, cover the tops of grouted masonry walls and other unfinished exposed cavity wall openings with secured plastic sheeting.

T. Curing: In dry weather, masonry exposed to wind and sun shall be wet with a fine water spray several times each day for at least 6 days, starting as soon as the mortar has set sufficiently to resist erosion.

U. Building Expansion Joints: Discontinue horizontal joint reinforcement across building expansion joints.

V. Non-load-bearing Concrete Masonry Unit Partitions: Partitions which extend up to structure above for fire, acoustical, or security reasons, shall terminate within 2" of structural deck, joists or beams to allow for deflection. Fill 2" gap with sealant and fire safing to achieve proper rating.

3.3 PROTECTION

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Maintain protective boards at exposed external corners which may be damaged by construction activities.

C. Provide protection without damaging completed work.

D. At the end of each day's work, cover the tops of masonry walls, window sills and jambs, door jambs, and other unfinished exposed cavity wall opening with plastic sheeting or other suitable material. Cover shall extend a minimum of 2' down both sides of walls and shall be held securely in place with Hohmann & Barnard, Inc. Masonry Wall Clamp No. HB3000.

E. Keep expansion joint voids clear of mortar.

3.4 POINT AND CLEAN

A. Pointing: Upon completion of the masonry work, fill and neatly point line nail holes and other defects. Remove mortar droppings from projecting surfaces.

B. Cleaning:
1. Clean face brick with a commercial cleaner. Test the cleaner on an inconspicuous area of face brick to insure that it performs as intended without leaving scum or residue. Before the solution is applied, soak the brick surface with clean water. Apply the cleaner in accordance with the manufacturer's instructions and rinse the surface thoroughly with clean water to remove traces of the cleaner. Protect metal and concrete surfaces from contact with the cleaner.
2. Clean glazed facing tile with brushes and clean water. Use no acids or abrasives.
3. Clean exposed concrete masonry units by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

3.5 FIELD QUALITY CONTROL

A. General: Owner will employ services of an independent materials testing laboratory to perform specified inspections and testing.

B. Coordinate with Owner’s testing laboratory to provide PERIODIC inspection of the following tasks:
1. As masonry construction begins, and every 5000 sq. ft. during construction, the following shall be verified to ensure compliance:
   a. Proportions of site prepared mortar.
   b. Construction of mortar joints.
   c. Location of reinforcement and connectors.
2. During construction, the inspection program shall verify:
   a. Size and location of structural elements.
   b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
   c. Specified size, grade, and type of reinforcement and anchor bolts.
   d. Protection of masonry during cold weather (temperature below 40°F.) or hot weather (temperature above 90°F.).
3. Prior to grouting at interior non-load-bearing partitions shown in the Architectural drawings, the following shall be periodically verified to ensure compliance:
   a. Grout space is clean.
   b. Placement of reinforcement and connectors.
   c. Proportions of site-prepared grout.
   d. Construction of mortar joints.

C. Coordinate with Owner’s testing laboratory to provide CONTINUOUS inspection of the following tasks:
1. Prior to grouting at masonry walls shown on the Structural Drawings, the following shall be continuously verified to ensure compliance:
   a. Grout space is clean.
   b. Placement of reinforcement and connectors.
   c. Proportions of site-prepared grout.
   d. Construction of mortar joints.
   e. Grout placement shall be verified to ensure compliance with code and construction document provisions.

END OF SECTION

SECTION 04 43 00

STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sawn and chopped stone thin veneer anchored to unit masonry back-up at exterior walls.
2. Metal anchors, mortar, and joint pointing.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 04 72 00 - Cast Stone Masonry.
3. Section 05 50 00 - Metal Fabrications: Shelf angles and supports.
4. Section 06 10 00 - Rough Carpentry: Wood framed supporting wall.
5. Section 07 62 00 - Sheet Metal Flashing and Trim: Coping and sill flashings.
6. Section 07 92 00 - Joint Sealers: Sealant for perimeter, and control joints.
7. Work Installed but Furnished under Other Sections:
8. Section 05 50 00 - Metal Fabrications: Metal fabricated items for building into the work.

1.2 SUBMITTALS

A. General: Submit shop drawings and product data under provisions of Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:
1. Indicate on shop drawings, layout, pertinent dimensions, anchorages, reinforcement, head, jamb, and sill opening details, and control jointing methods.
2. Submit manufacturer's field erection or setting drawings under provisions of Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
3. Submit Chopping and Setting Drawings:
   a. The chopped stone supplier shall prepare and submit to the Architect, for approval, complete chopping and setting drawings for all the limestone work under this contract. Such drawings shall show in detail the sizes, sections and dimensions of stone, the arrangement of joints and bonding, anchoring and other necessary details. If the contract drawings do not show the intent of the jointing, it will be the stone fabricator’s responsibility to establish the jointing in accordance with industry standards. The contractor shall furnish all field dimensions necessary for fabrication. These drawings shall be based upon and follow the drawings and full-size details prepared by the Architect except where it is agreed in writing that changes be made. Each stone indicated on these drawings shall bear the corresponding number marked on an unexposed surface with a non-staining paint.
   b. Projecting courses shall have beds in the wall at least 1” greater in depth than the projection, or be specially anchored to the structure as shown on setting drawings.
   c. Provision for the proper anchoring, dowelling, and cramping of work in keeping with standard practices, also for the support of stone by shelf angles and loose steel, etc. when required, shall be clearly indicated on the setting drawings.

C. Product Data:
1. Provide product data on stone units, mortar products, and reinforcements.
2. Submit manufacturer's installation instructions under provisions of Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

D. Samples: Submit four samples 12 x 12 inch in size illustrating minimum , average, and maximum sizes, color range and texture, markings, surface finish.

E. Mockup: Before installing stone masonry veneer, construct sample wall panels to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.

2. Build mockups in sizes approximately 48 inches long by 48 inches high by full thickness, including chopped stone, structural supporting wall, anchors, control joint condition, and include cast stone coping at top of mockup.
3. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   a. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
   b. When directed, demolish and remove mockups from Project site.
5. Provide mockup under provisions of SECTION 01 45 00 - QUALITY CONTROL.

1.3 QUALITY ASSURANCE

A. Stone Supplier: Company specializing in quarrying chopped stone with minimum of ten years documented experience.

B. Installer: Company specializing in installing chopped stone with 5 years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 65 00 - PRODUCT DELIVERY REQUIREMENTS.

B. Store and protect products under provisions of Section 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

C. Protect stone from visible discoloration.

1.5 PROJECT CONDITIONS

A. Maintain materials and surrounding air to a minimum 40 degrees F prior to, during, and 48 hours after completion of work.

B. During temporary storage on site, at the end of working day, or during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

C. Stain Prevention: Immediately remove grout, mortar, and soil to prevent them from staining the face of stone masonry veneer.
   1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed stone masonry veneer.

D. Hot-Weather Requirements: Protect stone masonry-veneer work when temperature and humidity conditions produce excessive evaporation of water from mortar. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

PART 2 - PRODUCTS

2.1 STONE

A. Stone Quarriers:
   Acme Stone
   Texas Quarries

B. Stone:
   1. Provide “Country Blend - Rough Chop” Natural Stone as provided by Acme Brick Company.
   2. Surface Texture: Chopped.
   3. Grade: free of defects.

4. Nominal Thickness: 3” to 5”
5. Face Size: Random
6. Backs: Rough
7. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.
8. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.
9. Cut drip slot in bottom surface of work projecting more than 1/2 inch over window frame. Size slot not less than 3/8 inch wide and 1/4 inch deep for full width of projection.

2.2 MORTAR

A. Mortar: ASTM C270 Type N using proportion specifications; with Type I Portland cement of color selected by Architect.

B. Water: Clean and potable.

2.3 ACCESSORIES

A. Anchors, Dowels, Ties, Cramps: Steel, ASTM A36, galvanized after fabrication to ASTM A123 1.25 oz/sq ft of sizes and configurations required for support of stone and applicable superimposed loads.

B. Supports: Steel, ASTM A36, galvanized after fabrication to ASTM A123, 1.25 oz/sq ft.

C. Bolts, Washers, and Nuts: Galvanized steel.

D. Flashings: Furnished under SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM.

E. Sealant: Type specified in SECTION 07 92 00 - JOINT SEALANTS, not detrimental to stone work.

F. Cleaning Solution: Type which will not harm stone, joint materials, or adjacent surfaces. Consult stone supplier for recommended type.

2.4 MORTAR MIX

A. Thoroughly mix mortar ingredients in quantities needed for immediate use.

B. Add mortar color in accordance with manufacturer's instructions. Ensure uniformity of mix and coloration.

C. Do not use anti-freeze compounds in mortar.

D. Use mortar within two hours after mixing.

E. If necessary, retemper mortar within two hours of mixing to replace water lost by evaporation.

2.5 STONE FABRICATION

A. Slope exposed top surfaces of stone and horizontal sill surfaces for natural wash.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive stone masonry veneer, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry veneer.
   1. Examine substrate to verify that inserts, reinforcement, veneer ties, flashing, and other items installed in unit masonry and required for or extending into stone masonry veneer are correctly installed.
   2. Examine wall framing, exterior sheathing, and asphalt-saturated felt covering to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
   3. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that support work and site conditions are ready to receive work of this Section.

C. Establish lines, levels, and coursing. Protect from disturbance.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Verify that items built-in under other Sections are properly located and sized.

B. Clean stone prior to erection. Do not use wire brushes or implements which will mark or damage exposed surfaces.

3.3 INSTALLATION

A. Back Checking & Fitting to Structural Frame:
1. Stone coming in contact with structural work shall be back checked as indicated on the general drawings. Stone resting on structural work shall have beds shaped to fit the supports.
2. Where stone facing adjoins columns and spandrel beams the depth of stone shall be such that will allow not less than 1” of clearance between the stone and structural members.

B. Erect stone in accordance with stone supplier's instructions and erection drawings.

C. Arrange stone pattern in Random (un-coursed) Pattern, and to provide a consistent joint width of 1/4 inch throughout.

D. Set stone in full mortar setting bed to support stone over full bearing surface and to establish joint dimensions.

E. Set stone to comply with requirements indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone masonry veneer in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

F. Maintain uniform joint widths, except for variations due to stone size variations and minor variations required to maintain bond alignment, if any. Lay walls with joint width of 1/4 to 3/8 inch

G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
1. Sealing expansion and other joints is specified in SECTION 07 92 00 - JOINTS SEALANTS.
2. Keep expansion joints free of mortar and other rigid materials.

H. Shore up units for 7 days after setting.

I. Install sealant and backing rod at joints.

J. Install flashings of longest practical length and seal watertight to back-up. Lap end joint minimum 6 inches and seal watertight.

3.4 TOLERANCES

A. Positioning of Elements: Maximum 1/4 inch from true position.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet; 1/2 inch in 50 feet.

C. Maximum Variation from Plumb: 1/4 inch per story non- cumulative; 1/2 inch in any two stories.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.5 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting any item not so indicated on Drawings.

B. Do not impair appearance or strength of stone work by cutting.

3.6 CLEANING

A. Remove excess mortar and sealant upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Use non-metallic tools in cleaning operations.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 04 72 00

CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Labor, materials and equipment to provide the cast stone as indicated on the drawings and specified herein.
2. The manufacturer shall furnish and deliver all cast stone covered by this specification.
3. Contractor shall unload, store and set all cast stone covered by this specification and shall provide and install all anchors for same.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:
1. Initial Selection:
a. Submit samples for color selection by Architect.
b. Submit samples for colored mortar, showing the full range of colors available.
2. Following color selection by Architect, re-submit 3 samples approximately 8" x 8", finished to show the variation in color and texture which will occur in the material delivered to the project site.

C. Product data:
1. Provide construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.
2. Test results of cast stone stone previously made by the manufacturer.
3. Qualification Data: Provide lists of completed projects with project names and addresses, names and address of architects and owners, and other information necessary.

D. Shop Drawings:
1. Drawings shall show the sizes, profiles, cross-sections, and dimensions of stone, the arrangement of joints, bonding, connections to adjoining walls or materials, anchoring methods, anchors, reinforcing, method of installation and anchoring.
2. Provide suitable wash on all exterior sills, copings, projecting courses and pieces with exposed top surfaces.
3. Window sills, when provided, shall have raised fillets at the back.
4. All projecting pieces and soffit stones shall have drips under the outer edge.
5. The shop drawings shall show the setting mark of each stone and its location on the structure. The stone when delivered shall bear the same corresponding setting mark on an unexposed surface.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Firm with not less than five years of continuous operation, having successful experience, adequate facilities, and capacity to furnish the quality, sizes, and quantity of cast stone required without delaying the progress of work.
2. Manufacturer shall be responsible for reinforcement and anchorage design.
3. Firm shall be a current producer member of the Cast Stone Institute.

B. The average water absorption of cast stone shall not exceed 6% by dry weight when tested in accordance with the requirements of ASTM C 642 or ASTM C 1195.

1.4 DELIVERY, STORAGE, AND HANDLING

A. All cast stone shall be carefully loaded and packed for transportation exercising customary and reasonable precaution against damage while in transit.

B. All cast stone shall be received and unloaded at the project site by competent workmen with the necessary care and handling to avoid damage and soiling.

C. Cast stone units delivered to the site shall be inspected for damage, unloaded, and stored with a minimum of handling. Damaged stone will be rejected and shall be removed from the project site.

D. Protect cast stone during storage and construction against wetting, soiling, staining, and damage.

E. The cast stone material shall be stored clear of the ground on non-staining planking or pallets in such a manner as to be protected from damage while in storage. Should cast stone be stored for an extended period, cover with polyethylene or other non-staining waterproof material.

1.5 PROJECT CONDITIONS

A. Environmental Requirements: No stone shall be set when freezing weather is expected.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide cast stone units as manufactured by one of the following:
Advanced Architectural Stone; Fort Worth, Texas
CSCS/Stone Legends; Dallas, Texas
Dallas Cast Stone, Inc.; Dallas, Texas

2.2 CAST STONE MATERIALS

A. Raw Materials:
1. Portland Cement: ASTM C 150, Type I or Type III, white, domestic manufacture.
2. Fine Aggregate: Carefully graded and washed natural sands, or manufactured granite, quartz or limestone sands meeting ASTM C 33 except that gradation may vary to achieve desired finish and texture.
3. Coarse Aggregate: Carefully graded and washed natural gravels, or crushed, graded stone such as granite, quartz, limestone or other durable stone meeting ASTM C 33 except that gradation may vary to achieve desired finish and texture.
4. Color and Finish:
a. Color shall be as selected by Architect**.**
b. Coloring Agent: Inorganic (natural or synthetic) iron oxide pigments complying with ASTM C 979, excluding the use of a cement grade of carbon black pigment, and shall be guaranteed by the pigment manufacturer to be non-fading and limeproof. The amount of pigment shall not exceed 10% by weight of the cement used.
c. The samples shall be approved by the Architect before the manufacturer shall be permitted to proceed with the work.
d. Match sample on file in Architect's office. Color and texture of cast stone shall be generally equal to the approved sample when viewed in direct daylight at a 10-foot distance.
e. Exposed surfaces, unless shown otherwise, shall exhibit a fine grained texture similar to natural stone. No bug holes or air voids will be permitted.
f. Variation: Must match color and finish of approved sample subjected to similar aging and weathering conditions when viewed in direct daylight at a 10 foot distance.
5. Admixtures - ASTM C 494.
6. Water: Clean, potable and free of deleterious amounts of acids, alkalies, or organic materials.

B. Physical Properties:
1. Cast stone shall have a minimum compressive strength of 6,500 psi at 28 days when tested in accordance with ASTM C 1194.
2. Multiply requirements of field cut or core drilled specimens by 80% to determine minimum compressive strength requirements.

C. Curing and Finishing:
   1. Cure units in a warm, moist curing chamber at 95% relative humidity for 24 hours, or yard cure for 350 degree-days (i.e. 7 days @ 50°F. or 5 days @ 70°F.) prior to shipment.
   2. Acid-etch exposed surfaces to remove cement film prior to packaging for shipment.

2.3 REINFORCING AND ANCHORS

A. Reinforcing Bars: ASTM A 615, Grade 60. Bars shall be hot-dipped zinc coated after fabrication in accordance with ASTM A 123.

B. Reinforcing Mesh: ASTM A 185, No. 3 gage zinc-coated wire rods electrically welded on 4" centers each way.

C. Anchors, inserts, and dowels shall be corrosive resistant, galvanized, brass or stainless steel Type 304.

D. Cast stone panels shall be reinforced as may be required for handling, and to allow for temperature changes and structural stress.

E. There shall be a minimum steel reinforcement amounting to ¼ percent of the cross-section area of the panel and should the panel be greater than 12" in any sectional dimension, the temperature steel shall be placed in both directions.

F. Reinforcement shall be galvanized or epoxy coating when covered with less than 1-1/2" of material.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, white, domestic manufacture.

B. Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean, washed, masonry natural sand.

D. Color: ASTM C979, Non-fading, iron oxide, limeproof pigment to produce mortar color as selected by Architect to match existing. The Architect shall approve the actual color sample of mortar before proceeding with grouting or pointing.

E. Water: Clean and free of deleterious amounts of acids, alkalies, or organic materials.

2.5 MORTAR MIXES

A. Setting Mortar: Proportions by volume:
   1 part Portland cement
   1 part lime
   6 parts white silica sand

B. Pointing Mortar: Proportions by volume:
   1 part Portland cement
   1 part lime
   6 parts white silica sand

C. Coloring agent as required to provide consistent custom color.

2.6 FABRICATION

A. General: Cast stone shall be Type I complying with ASTM C 1364, color as selected by Architect. Cast units shall be free from defects such as cracks, loose aggregate, broken edges, and marred finish surfaces which may affect appearance or serviceability. All units shall be equal in color and surface texture to approved samples.

B. The manufacturer shall be responsible to design a mix which achieves both the strength and the surface finish desired.

C. The average water absorption of cast stone shall not exceed 6% by dry weight when tested in accordance with the requirements of this specification.

D. All casting shall be done in accurate molds designed to withstand high frequency vibration. Steel reinforcement units shall be accurately placed. Vibration shall be continuous during the casting process until full specified thickness is reached and all excess water brought to the surface.

E. Curing: No cast stone shall be shipped to the project site until after it has been properly cured at the manufacturer's plant as specified.

F. Fabrication Tolerances: Comply with Cast Stone Institute Technical Manual (current edition).
1. Height and Width: Plus 1/16", minus 1/8"
2. Length:
   a. Up to 2'-0": Plus 1/16", minus 1/8"
   b. 2'-0" to 5'-0": Plus 1/8", minus 1/8"
   c. 5'-0" to 10'-0": Plus 1/8", minus 3/16"
3. Setting tolerances: Plus or minus 1/8" allowable out of plane from adjacent unit.
4. Joints: +1/16", -1/8".

PART 3 - EXECUTION

3.1 JOINTING

A. Joint Size:
1. At stone/brick joints - 3/8".
2. At stone/stone joints in vertical position - 1/4"
3. Stone/stone joints exposed on top side - 3/8".

B. Joint Material:
1. Use a full bed of mortar at all bed joints.
2. Sealant: Head joints in copings, and joints at column covers, cornices, platforms, soffits, window sills, and in general, all stone sections with projecting profiles, exposed top joints or rigid suspension connections to the supporting structure should be set with unfilled joints. After setting, prime the ends of stones, insert properly sized foam back-up rod to proper depth, and gun-in sealant.
3. Mortar: Masonry-bound trim such as belt courses, lintels, window surrounds, date stones, inscription blocks, quoins, keystones, similar applications, and vertical joints shall be mortar joints.
4. Rake all mortar joints 3/4" for either pointing mortar or sealant as selected by Architect.

C. Location of joints:
1. As shown on approved shop drawings.
2. Unless otherwise shown, at control and expansion joints per plan.

3.2 ERECTION

A. Stone shall be clean. Before setting, sponge or drench with clean water.

B. Set stone units level, square, and true with uniform mortar joints as specified.

C. All cast stone shall be set by experienced masons, accurately and in accordance with the shop and setting drawings.

D. Unless otherwise noted, every stone shall be set in a full bed of mortar.

E. Reference “Joint Materials” paragraph in the “Jointing” Article above for direction on erection/installation at the different joint areas.

F. All anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar or non-shrink grout.

G. All anchors, dowels and other anchoring devices shall be furnished by the setting contractor as shown on approved shop drawings using, whenever possible, standard building stone anchors commercially available in a non-corrosive material such as galvanized steel, brass or Type 304 stainless steel.

H. When setting with mortar, all stones not thoroughly wet shall be drenched with clear water just prior to setting.

I. After each stone has been set, all joints shall be raked to a depth of 3/4" from the face for pointing. The face of each stone shall then be sponged off to remove any splashed mortar or mortar smears.

J. Only the ends of lugged sills and similar stones shall be embedded in mortar. The balance of joint to be left open until pointing of stone work, than tuck points on face only to a depth of 3/4". Tuck point stone joints to a slight concave.

K. All stone shall be protected from splashing mortar or damage by other trades.

L. Form weep holes at the bottom of every vertical joint. Form weep holes with 1/4" oiled sash cord or plastic tubing and remove when the mortar has set.

M. Installation tolerances shall be in accordance with requirements of SECTION 04 20 00 - MASONRY UNITS.

3.3 TESTING

A. Testing shall be performed in accordance with ASTM C 31, ASTM C 39, ASTM C 642, and ASTM C 1194, except that 2" cube specimens shall be used, oven-dried in accordance with ASTM C 97.

B. Test three specimens per 500 cubic feet at random from plant production in accordance with referenced standards.

C. The results of compression tests shall be divided by a factor of 0.8 when saw-cut or core-drilled specimens are used.

3.4 PATCHING AND CLEANING

A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with materials furnished by the manufacturer and according to this direction.

B. Before pointing, the face of all cast stone shall be scrubbed with a fibre brush, using soap powder and water and shall then be thoroughly rinsed with clean running water. Any mortar on the face of the cast stone shall be removed. No acids or prepared cleaners shall be used without the approval of the cast stone manufacturer.

3.5 POINTING AND CAULKING

A. When ready for pointing, the joints shall be dampened and carefully pointed to a slight concave unless otherwise specified by the Architect. No pointing shall be done in freezing weather nor in locations exposed to hot sun, unless properly protected. The Architect shall approve color of pointing mortar before proceeding with pointing.

B. Head joints in copings and similar stones shall be caulked with a joint sealant used in accordance with the manufacturer's instructions.

3.6 INSPECTION AND ACCEPTANCE

A. Applicable standards for inspection and quality control shall be ACI Committee 311 Manual of Concrete Inspection and PCI MNL-117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

B. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye at a 20 ft. distance in good typical daylight illumination.

3.7 PROTECTION

A. Cast stone shall be protected after erection and until final cleaning by non-staining rosin sized paper or polyethylene film of not less than 4-mil thickness.

B. Cast stone at entrances shall be protected until substantial completion is achieved.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel columns
2. Steel beams
3. Fusion welded anchors
4. Miscellaneous angles and plates
5. Bolts
6. Steel assemblies to be embedded in concrete
7. Laboratory testing and inspection
8. Shop painting
9. Supplementary parts and members necessary to complete and erect structural steel frame

1.2 REFERENCE STANDARDS (Latest Edition)

A. American Institute of Steel Construction, AISC:
1. AISC Manual of Steel Construction.
2. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
3. Code of Standard Practice for Steel Buildings and Bridges.
4. Specification for Structural Joints Using ASTM A325 or A490 Bolts.

B. American Society for Testing and Materials:
1. ASTM A36, Standard Specification for Structural Steel.
2. ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108, Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
4. ASTM A123, Standard Specification for Zinc (Hot- Galvanizing) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, bars and strip.
5. ASTM A143, Recommended Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
6. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
8. ASTM A307, Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
9. ASTM A325, Standard Specification for High-Strength Bolts for Structural Steel Joints.
10. ASTM A449, Standard Specification for Quenched and Tempered Steel Bolts and Studs.
11. ASTM A490, Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
12. ASTM A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
14. ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
15. ASTM A786, Standard Specification for Hot-Rolled Carbon, Low Alloy, High Strength Low Alloy, and Alloy Steel Floor Plates
16. ASTM A992, Standard Specification for Steel for Structural Shapes for Use in Building Framing.
17. ASTM F1554, Standard Specification for Anchor Bolts
18. ASTM B117, Standard Salt Spray (Fog) Testing.
19. ASTM D522, Standard Test for Elongation of Attached Organic Coatings with Conical Mandrel Apparatus.

C. American Welding Society:
1. AWS D1.1, Structural Welding Code - Steel.
2. AWS D1.3, Structural Welding Code - Sheet Steel.

D. Industrial Fasteners Institute:
   1. Handbook on Bolt, Nut and Rivet Standards.

E. American National Standards Institute:
   1. ANSI B18.2, Fasteners.
   2. ANSI B27.2, Plain Washers.

F. The Society for Protective Coatings, SSPC:
   1. SSPC Painting Manual, Volume 1, Good Painting Practice.
   2. SSPC Painting Manual, Volume 2, Systems and Specifications.

1.3 SUBMITTALS

A. Shop Drawings: Submit detailed shop and installation drawings showing shop and erection details including member sizes, grades of materials, details of fabrication and erection, and end connections.
   1. Do not begin fabrication of materials prior to review of shop drawings.
   2. Review of shop drawings is for member sizes, spacings, detail, and general compliance with Contract Documents only.
   3. Material quantities, lengths, fit, verification of job conditions and coordination with other trades are responsibility of Contractor.
   4. Calculations: Submit calculations for connections as required, signed and sealed by a Professional Engineer experienced in such design and registered in the State of the Project.
   5. Reproductions of Contract Drawings shall not be used for shop drawings.

B. Erection Procedure: Submit descriptive data illustrating general procedure for erection of structural steel including sequence of work, proposed schedule and details of temporary staying and bracing.

C. Submit Mill Certifications showing compliance of materials with ASTM and AISC Specifications.

D. Submit Mill Certifications (Manufacturer's Inspection Certificates) for bolts, nuts and washers.

E. Submit manufacturer’s data sheets or certified test results indicating compliance with requirements for manufactured components.

F. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
   1. Product Disclosure:
      a. If available, provide a product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which the product manufacturer is explicitly recognized as a participant by the program operator.
      b. If available, provide a third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of the product contents.
      c. If available, provide a published Health Product Declaration (HPD) for each product documenting the role, amount, and health hazards for every ingredient of the product.
   2. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate material cost of product less labor included in project.
      c. If recycled content is part of an assembly, indicate the percentage of pre-consumer and post-consumer recycled contents in the assembly by weight.
   3. Local / Regional Materials:
      a. Indicate location of extraction, manufacture, and purchase of all products; indicate distance between the points of extraction, manufacture, and purchase and the project site.
      b. Indicate the material cost less labor of all products extracted, manufactured, and purchased within a 100 mile radius of the project site.

1.4 QUALIFICATIONS

A. Arc-Welding: Welding procedures and techniques, welders and tackers shall be qualified in accordance with AWS D1.1.

1. Welders to be employed on Work shall maintain current AWS certification throughout duration of Project.
2. If requested by Architect, submit identifying stenciled test coupons made by operator whose workmanship is subject to question, and if reasonable doubt of proficiency exists, welder shall be re-qualified and certified by independent testing laboratory at no additional expense to Owner.
3. Work suspected of deficient quality may be subject to removal of coupons from any location on any joint for testing. Remove sections of welds found defective and properly rewelded before proceeding with work.

B. Steel Fabricator: not less than 5 years of experience in fabrication of structural steel.

C. Steel Erector: not less than 5 years of experience in erection of structural steel.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of anchor bolts and other anchorage assemblies to be embedded in concrete or masonry construction. Provide setting drawings, instructions and templates required for proper placement of anchor bolts and embeds.

B. Sequence shipments of fabricated steel to expedite erection and minimize field handling of material.

C. Store structural steel above ground on skids or platforms, and protect from corrosion. Store packaged materials in unbroken containers.

D. Do not bend or damage materials during shipment, handling and erection.

E. Take precautions in the removal of packaging or bundling devices to prevent damage to materials.

F. Certification numbers for fasteners shall appear on product containers and shall correspond to identification numbers on mill test reports.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel, normal grade: ASTM A36.

B. High Strength Structural Steel: ASTM A572 - Grade 50.

C. High Strength Structural Steel (W-Sections): ASTM A992 – Grade 50.

D. Steel Pipes: ASTM A53 - Grade B (35,000 psi yield).

E. Hollow Structural Sections (HSS) – Round or Rectangular: ASTM A500 - Grade B.

F. Erection Bolts: ASTM A307, ANSI B18.2.1, and ANSI B18.2.2.

G. High Strength Bolts: ASTM A325N, ANSI B18.2.1, ANSI B18.2.2.
1. Manufacturer's symbol and grade markings shall appear on bolts and nuts.

H. Anchor Bolts: ASTM F1554 Grade 36

I. High Strength Anchor Bolts: ASTM F1554 Grade 105.

J. Washers: ANSI B27.2 Type A.

K. Welding Electrodes:
1. Welding electrodes shall conform to AISC Specifications. Use E70 electrodes for ASTM A36 and ASTM A572 Grade 50 Steel. Use E8018 for ASTM A441 steel.

2. Coatings of low-hydrogen electrodes shall be thoroughly dry when used. Electrodes taken from hermetically sealed packages shall be used within 4 hours, or shall be dried in accordance with AWS D1.1 before use.
3. Do not use electrodes of any type that have been wet.

L. Coatings for structural steel
1. Shop Primer:
a. Rust-inhibiting primer
b. Paint and methods of paint application shall comply with applicable air-quality and environmental regulations.
c. Paint shall be compatible with welding procedures and shall produce no significant difference in strength of weld material.
d. Paint shall meet or exceed requirements for abrasion - Fed. Test No. 141; elongation - ASTM D522; and salt spray - ASTM B117.
2. Primer for Architecturally Exposed Structural Steel
a. Acceptable Products:
1) Tnemec 10-09
2) Valspar 13-R-29
3) Carboline Phenoline 818
4) Sherwin-Williams Kem Kromik Universal B50 Series
3. Zinc-Coating: Where galvanizing steel is required, zinc coating shall conform to ASTM A123 and A143. Zinc coating for threaded products shall conform to ASTM A153. Do not galvanize ASTM A490 bolts.
4. Cold Galvanizing: Galvilite as manufactured by ZRC WORLDWIDE, Marshfield, MA (phone 800.831.3275; web site www.zrcworldwide.com), and used for repair only.

2.2 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document the product's environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document the chemical inventory of the product to at least 0.1%.

2.3 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below the industry average in the following categories:
1. Global warming potential
2. Depletion of the stratospheric ozone layer
3. Acidification of land and water sources
4. Eutrophication
5. Formation of tropospheric ozone
6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 25% of the total value of the materials in the project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk program.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products that are sourced within 100 miles of the project site.

2.4 DESIGN OF CONNECTIONS

A. Complete penetration butt weld moment connections to develop 100% of flexural capacity of member.

B. Except as specifically noted otherwise, detail bolted connections using bolts conforming to ASTM A325N, Bearing Type Connections with threads allowed in shear plane. Details shall be in accordance with AISC Specification for Structural Joints.

C. Do not use welds in combination with bolts in the same face of any connection.

2.5 FABRICATION

A. Fabricate materials in accordance with applicable AISC Specifications and Standards.

B. Pre-assemble work as much as possible and deliver to site ready for erection. Mark and match-mark pieces where field assembly is required.

C. Prior to fabrication; straighten materials, remove twists and bends and clean faying surfaces of scale and rust.

D. Clean members to be painted with power tools in accordance with SSPC standards.

E. Camber beams to within 1/8th inch per 15 feet of beam length. Mark beams indicating direction of fabricated or natural camber.

F. Provide members of required sizes, weights, shapes and lengths. Do not splice members to achieve required lengths except where specifically allowed by the Architect. Do not alter member shapes or lengths or enlarge bolt holes in the field for proper fit; return materials to the fabrication shop for correction where required. Member splices allowed for the convenience of the fabricator or erector shall not result in additional cost to the Owner.

G. Punch or drill holes for bolts. Hole sizes shall conform to AISC Specifications.

H. Compression joints shall have both contact surfaces milled for precision fit. Other joints shall be cut or dressed straight and true, and prepared as required for welding. Components of assemblies and built-up members shall be pinned and rigidly maintained in accurate position during final assembly.

2.6 WELDED CONSTRUCTION

A. Comply with AWS D1.1.

B. Clean surfaces of loose scale, rust, paint, grease and dirt. Remove oil with benzine. Wire brush welds after depositing for visual inspection. Welds shall be smooth and uniform in cross section, shall be free of porosity and clinkers, and shall have required fusion and penetration into base metal.

C. Secure members in proper position for welding.

D. Take proper precautions to minimize residual stresses and distortions in members being welded.

E. Preheat and interpass temperatures shall conform to Table 3.2, AWS D1.1.

F. Prepare members to be butt-welded in accordance with AISC recommendations for pre-qualified welds, and provide required clearances and back-up bars. Remove back-up bars after completing welds.

G. Lay fillet welds of required sizes in proper position and with gaps not exceeding AISC recommendations.

H. Tack welding shall not affect quality of finished welds.

2.7 BOLTED CONSTRUCTION

A. Provide holes at right angles to members of sizes recommended by AISC Specifications. Short-slotted holes shall not be used for primary frame connections (members connecting to columns), trusses and wind bracing unless specifically allowed by the Architect. Where used, short-slotted holes shall be oriented normal to the direction of load.

B. Provide beveled washers for surfaces out of parallel more than 1:20.

C. Provide bolts of sufficient length to extend entirely through nuts.

D. Protect fasteners from dirt and moisture at job site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protective storage. Fasteners not used shall be returned to protected storage at end of shift. Fasteners shall not be cleaned of lubricant that is present in as-delivered condition.

E. Anchor bolts and erection bolts: tighten with a suitable wrench not less than 15 inches long. Tap bolt heads with a hammer while tightening.

F. High Strength Bolts (typical, except as noted otherwise): install bolts in properly aligned holes, and tighten to snug tight condition. Snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact.

G. Hand tighten and tack weld (nut-to-bolt shank) bolts required to be "finger-tight".

H. Holes for anchor bolts in base plates may be oversized in accordance with AISC Specifications. Provide washers as indicated on Drawings.

2.8 COATINGS

A. SHOP PAINTING
1. Apply one coat of rust-inhibitive primer to surfaces of structural steel members except: surfaces required to be field welded, to be encased in concrete, to be spray fireproofed, and top flanges of beams with shear connectors to support metal deck.
2. Thoroughly clean surfaces to be painted of all loose mill scale, dirt, rust, and other foreign matter with steel scrapers, wire brushes, or sandblasting in accordance with SSPC SP-3. Remove oil and grease with solvents.
3. Mix paint in accordance with manufacturer's recommendations, continuously stir during application, and do not add thinner after initial mixing.
4. Apply paint in accordance with manufacturer's recommendations, thoroughly work over surfaces and into corners. Minimum dry thickness of coating shall be 2 mils.
5. Repair damage to coating prior to delivery.

B. GALVANIZING
1. Galvanize exposed steel members as noted on Drawings.
2. Shelf angles supporting masonry or stone shall be galvanized.

2.9 PRODUCTS

A. FUSION WELDED ANCHORS
1. Comply with AWS D1.1, Section 7.
2. Clean surfaces to be welded of rust, oil, grease, paint and dirt. Remove mill scale by scraping or sandblasting.
3. Weld headed studs with appropriate equipment properly adjusted for climactic conditions.
4. Remove ceramic ferrules after welding.

2.10 SOURCE QUALITY CONTROL

A. Testing of Shear Studs:
   1. When temperature is below 32 degrees F, one stud in each 100 shall be tested.
   2. Minimum of 2 shear studs shall be tested at start of each production period in order to determine proper generator, control unit and stud welder setting. Studs shall be capable of being bent 45 degrees from vertical without weld failure. If, after welding, visual inspection reveals that sound weld or full 360 degree fillet has not been obtained for a particular stud, stud shall be struck with hammer and bent 15 degrees off perpendicular toward nearest end of beam. Studs failing this test shall be replaced.

B. Pre-Erection Testing of High Strength Bolts
   1. Test at least three bolt, nut and washer assemblies from each lot of bolts supplied to job site.
   2. Test assemblies in a tension measuring device at site to verify that assemblies can develop tension listed in Table 4 of AISC Specification for Structural Joints.
   3. Bolt tension shall be developed by tightening of nut.

C. Inspection of Structural Steel:
   1. Provide access to materials in fabrication and full cooperation to testing laboratory.
   2. Following testing services shall be performed:
      a. Inspect fabrications in shop.
      b. Check temporary bracing of steel frame.
      c. Check location and condition of anchor bolts.
      d. Check plumbness and tolerance of steel frame.
      e. Qualification of welders and welding techniques.
      f. Visually inspect erection bolts.
      g. Inspection of high-strength bolting:
         1) In accordance with Section 9 of AISC Specifications for Structural Joints.
         2) Confirm that fasteners meet project specification and are properly stored and handled.
         3) Confirm that faying surfaces have been properly prepared before connections are assembled.
         4) Observe testing and calibration and confirm that procedures used result in the required fastener tension.
         5) Visually inspect connections.
      h. Visually inspect all field and shop welds.
      i. Complete-penetration welds.
         1) Ultrasonic or X-ray testing per AWS Standards.
         2) Testing shall be performed on 100% of shop and field complete-penetration welds.
      j. Re-inspect corrective measures required at expense of Contractor.

D. Remove and replace Connections found to be faulty at no additional cost to the contract.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify condition and position of anchor bolts and embeds in concrete prior to commencing erection.

B. Correct misaligned or missing components required for connections to steel framework before commencing erection.

C. Measure camber of erected steel beams and report deviations from required camber before placing concrete slabs. Do not place concrete on beams that have inadequate or negative camber.

3.2 ERECTION AND FIELD ASSEMBLY

A. Erect structural steel in accordance with AISC Specifications. Work shall be plumb, square, true to line, level and in proper position and orientation.

B. Provide temporary bracing and guys to maintain stability of framework during erection for stresses and loads due to erection equipment and its operation, weight of structure, wind, and temporary loads imposed during erection. Check and adjust bracing frequently during progress of erection and assembly. Maintain

temporary bracing until all components of the structure required for lateral stability are in place and final connections made.

C. Do not stack materials on partially completed framework, or in a manner to cause damage or overloading of the structure.

D. Tolerances shall be in accordance with AISC Code of Standard Practice and as follows:
   1. Displacement of columns adjacent to elevator shafts not to exceed 1 inch at any point.
   2. Individual members plumb or level to within 1:750.
   3. Vertical dimensions: 1/4 inch per story, exclusive of elastic shortening of columns.
   4. Floor framing members: +-1/4 inch from column splice next above.
   5. Horizontal dimensions: +- 1:2000 for overall length or width.

E. Field Assembly:
   1. Assemble steel framework accurately to lines and elevations indicated and within specified tolerances. Align and adjust members forming parts of a completed frame before fastening.
   2. Erect structural steel in proper sequence with work of other trades.
   3. Tie anchor bolts securely in position before concrete is placed.
   4. Thoroughly clean bearing surfaces and surfaces to be in permanent contact before assembly.
   5. Adjust bolt holes requiring enlargement only by reaming, not by drifting or burning.
   6. Erection bolts may be tightened and left in place, except in architecturally exposed work. Fill holes left from removed bolts by plug welding. Grind welds smooth where architecturally exposed.
   7. Straighten and correct members damaged during handling, or replace without additional cost to the Owner.
   8. Where shoring of beams and girders is required, provide positive support at midpoint of spans under 25 feet and at third points of spans over 25 feet. Locate temporary supports directly above beams at the supporting floor, or transfer load to beams with load spreaders. Re-shore where construction loading exceeds live load capacity of supporting floor.

F. Field Connections:
   1. After frame is aligned and plumb, make final welded and bolted connections in accordance with AISC Specifications.
   2. Properly sequence welding to prevent distortion, and misalignment of the framework.
   3. Maintain temporary bracing of the structure until connections are complete and other required components of the structure (e.g. floor slabs and metal roof decks) are in place.

3.3 ADJUSTING

A. Touch-up field welds, abrasions and scarred areas of structural steel with same paint used for shop coating after erection of frame and final connections are completed.

3.4 FIELD PAINTING

A. Refer to Section 09 90 00 for field painting of exposed steel.

END OF SECTION

SECTION 05 21 00

STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pre-engineered steel joists
2. Bridging
3. Ceiling extensions
4. Bearing plates
5. Side wall anchors
6. Extended ends

1.2 REFERENCES

A. Steel Joist Institute, SJI:
1. Standard Specifications for Open Web Steel Joists, K-Series; and Standard Load Table, Open Web Steel Joists, K-Series.
2. Standard Specifications for Longspan Steel Joists LH Series; and Standard Load Table, Longspan Steel Joists, LH Series.
3. Standard Specifications for Deep Longspan Steel Joists, DLH Series; and Standard Load Table, Deep Longspan Steel Joists, DLH Series.
4. Standard Specifications for Joist Girders.
5. Recommended Code of Standard Practice for Steel Joists and Joist Girders.

B. American Society for Testing and Materials:
1. ASTM A36, Standard Specification for Structural Steel.
2. ASTM A307, Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.

C. American Welding Society:
1. AWS A5.5, Specification for Steel, Low-Alloy, Covered Arc Welding Electrodes.
2. AWS D1.1, Structural Welding Code - Steel.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop and erection drawings to include member marks, number, type, location, and spacing of members; details of bridging, extended ends and attachment at supports.
1. Reproduction of Contract Drawings shall not be used for drawings.

B. Design: Indicate on shop drawings where special designs have been provided, including a detailed, written description of magnitudes and locations of loads for each special design loading condition.

C. Submit Certified mill test reports showing compliance with requirements of ASTM and SJI Specifications.

D. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Product Disclosure:
a. If available, provide a product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which the product manufacturer is explicitly recognized as a participant by the program operator.
b. If available, provide a third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of the product contents.
c. If available, provide a published Health Product Declaration (HPD) for each product documenting the role, amount, and health hazards for every ingredient of the product.
2. Recycled Content:
a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.

b. Indicate material cost of product less labor included in project.
c. If recycled content is part of an assembly, indicate the percentage of pre-consumer and post-consumer recycled contents in the assembly by weight.

3. Local / Regional Materials:
   a. Indicate location of extraction, manufacture, and purchase of all products; indicate distance between the points of extraction, manufacture, and purchase and the project site.
   b. Indicate the material cost less labor of all products extracted, manufactured, and purchased within a 100 mile radius of the project site.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Member of Steel Joist Institute
   2. Fabrications, handling, erection and connections of steel joists shall be in accordance with latest editions of SJI Specifications.

B. Welding Operator Qualifications:
   1. Certified within 6 months previous

1.5 DELIVERY, STORAGE AND HANDLING

A. Mark pieces for identification during erection.

B. Deliver to site in proper sequence for erection.

C. Store materials above ground; prevent corrosion, warpage and twisting.

D. Do not bend or damage members during handling.

E. Take precautions breaking bundles to prevent damage to materials and injury to workmen.

1.6 DESIGN

A. Joists shall be designed by the fabricator in accordance with the specifications of the Steel Joist Institute.

B. Where loads are shown or specified, members shall be designed for the specific loading conditions required.

C. Where loadings are not shown, members shall be designed for the maximum allowable load indicated in the standard load tables published by the Steel Joist Institute for the member designation and spans required.

D. Fabricator shall determine and include in the work any and all special bridging or temporary bracing required for proper erection or final assembly of the work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel bridging, bearing plates and wall anchors: comply with ASTM A36.

B. Bolts: comply with ASTM A307.

C. Welding Electrodes: comply with AWS A5.5, E70 or submerged arc Grade SAW-2.

D. Steel Joists: comply with SJI Specifications.
   1. Provide double angle bottom chords.
   2. Provide extended ends where required.

E. Paint: rust-inhibiting primer; comply with SJI Specifications; paint and methods of paint application shall comply with applicable air-quality and environmental regulations.

2.2 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document the product's environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document the chemical inventory of the product to at least 0.1%.

2.3 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below the industry average in the following categories:
   1. Global warming potential
   2. Depletion of the stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 25% of the total value of the materials in the project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk program.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products that are sourced within 100 miles of the project site.

2.4 FABRICATION

A. Design and fabricate joists in accordance with SJI Specifications.

B. Accessories: Provide required sag rods, bridging, extended bottom chords and top chords, side wall anchors, wall connectors, headers, and ceiling extensions.

C. Shop Paint: After fabrication, clean joists, bridging, and anchors of rust, mill scale, dirt and other foreign material. Remove grease and oil with solvents. Apply one coat of paint, minimum thickness of 1 mil.
   1. Paint coat for steel exposed in crawl space not less than 3.0 mils thick.

D. Extended Ends: Design to cantilever from the main span of the joist, provide load capacity at least equal to that of joist.

E. Provide horizontal and X-bridging as required, minimum bridging requirements in accordance with SJI Specifications.

2.5 SOURCE QUALITY CONTROL

A. Laboratory Testing and Inspection
   1. Inspect fabricating and welding procedures in shop.
   2. Visually inspect shop welds.
   3. Inspect painting procedures.
   4. Check material certifications in shop.

PART 3 - EXECUTION

3.1 ERECTION

A. Replace joists damaged by bending or warping during handling and erection.

B. Bridging shall comply with SJI Specifications and with details on Drawings.

C. Minimum bearing and anchorage shall comply with SJI Specifications and Drawings as related to particular type of support.

D. Provide erection bolts for joists located on column centerlines.

E. Set joists to lines, levels, and spacing as indicated. Provide bearing plates as indicated or required to carry out structural requirements. Execute general handling and erection in accordance with SJI Specifications.

F. Permanently fasten joists to supports and install bridging and anchorage before any construction loads, other than workmen, are placed on joists.

G. Perform welding in accordance with AWS D1.1.

H. Properly store and protect electrodes to prevent deterioration or damage by moisture and climate.

I. After erection, touch up field connections and abraded places of shop paint with same kind of paint as shop coat.

J. Do not weld bottom chords of joists to supports until full dead load of roof is applied. Brace joists and supporting structure for safety and stability until permanent bracing structures are in place.

K. Do not use bridging to support conduit, piping, duct work, or other equipment.

L. Do not attach hangers supporting loads in excess of 100 pounds directly to joist chords. See details on Structural Drawings for methods of supporting loads in excess of 100 pounds on joists.

3.2 ADJUSTING

A. Touch-up abrasions and welds with shop paint.

B. Correct or replace damaged materials at no additional cost to the Owner.

3.3 FIELD QUALITY CONTROL

A. Laboratory Testing and Inspection
   1. Inspect condition of materials after erection.
   2. Inspect connections to supporting structure.

END OF SECTION

SECTION 05 31 23

METAL ROOF DECK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal Roof Deck
2. Sheet Metal Accessories

1.2 REFERENCES (Latest Edition Available)

A. Steel Deck Institute (SDI), Specifications and Commentary for Steel Roof Deck.

B. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members.

C. American Welding Society:
1. AWS A5.1, Specification for Steel, Carbon, Covered Arc Welding Electrodes.
2. AWS D1.3, Structural Welding Code - Sheet Steel.

D. American Society for Testing and Materials:
1. ASTM A90, Standard Tests for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
2. ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
4. ASTM A1008, Standard Specification for Steel Sheet, Cold-Rolled Sheet, Carbon, Structural.
5. ASTM B117, Standard Salt Spray (Fog) Test.
6. ASTM D714, Evaluating Degree of Blistering of Paints.
7. ASTM D1654, Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

E. Underwriters Laboratories, Inc.:
1. Bulletin of Research No. 52, Development of Apparatus and Test Method for Determining Wind Uplift Resistance of Roof Assemblies.
2. Standard UL580, Tests for Wind Uplift Resistance of Roof Assemblies.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings for review prior to fabrication or installation of materials.
1. Indicate erection layouts, details, steel deck dimensions and section properties, and installation instructions. Show supporting framing, lengths and markings of deck to correspond with sequence and procedure to be followed in installing and fastening deck. Show methods of fastening deck and installing accessories. Show locations, types and sequence of welded connections for deck units.
2. Indicate welds using standard AWS welding symbols. Show size and number of holes to be cut in deck.
3. Indicate allowable diaphragm shear capacity corresponding to pattern and type of connections provided.

B. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Product Disclosure:
a. If available, provide a product specific Type III, third party certified, Environmental Product Declaration (EPD) for each product in which the product manufacturer is explicitly recognized as a participant by the program operator.
b. If available, provide a third party verified Corporate Sustainability Report (CSR) for each product that covers at least 90 percent of the product contents.

c. If available, provide a published Health Product Declaration (HPD) for each product documenting the role, amount, and health hazards for every ingredient of the product.

2. Recycled Content:
   a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   b. Indicate material cost of product less labor included in project.
   c. If recycled content is part of an assembly, indicate the percentage of pre-consumer and post-consumer recycled contents in the assembly by weight.
3. Local / Regional Materials:
   a. Indicate location of extraction, manufacture, and purchase of all products; indicate distance between the points of extraction, manufacture, and purchase and the project site.
   b. Indicate the material cost less labor of all products extracted, manufactured, and purchased within a 100 mile radius of the project site.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications
   1. Member Steel Deck Institute.
   2. Minimum 5 years of experience.

B. Erector Qualifications
   1. Minimum 5 years of experience.
   2. Welders certified within previous 6 months.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver deck in bundles and store on pallets above the ground, protect from corrosion and damage. Rusted, crimped or bent deck shall not be installed in the work.

B. Do not store materials on installed deck before connecting to supporting structure.

C. Do not overload deck during construction by workmen or storage of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Grades:
   1. ASTM A1008, Grade C for painted deck.
   2. ASTM A653, Grade A for galvanized deck.

B. Miscellaneous steel plates at vents, sump pans, and closures: 20 gage material.

C. Welding Rods: AWS A5.1, E70

D. Weld Washers: 14 gage, with 3/8ths diameter hole at center.

E. Galvanizing:
   1. Wiped zinc coating, 0.2 to 0.5 ounces per square foot, complying with ASTM A924.
   2. Comply with ASTM A90 and A239 for weight and uniformity.

F. Paint:
   1. Resistant to solvents used to clean deck.
   2. Resistant to solvents in foamed-in-place insulation.
   3. Resistant to corrosion and blistering in accordance with ASTM B117, D714 and D1654.

2.2 PRODUCT DOCUMENTATION

A. In coordination with Project sustainability goals, provide products with third-party certified Type III Environmental Product Declarations (EPDs) in accordance with ISO 14025 that document the product's

environmental impacts associated with material extraction, energy use, chemical makeup, waste generation, and emissions.

B. In coordination with Project sustainability goals, provide products with third-party verified corporate sustainability reports (CSRs) that document material supply chains and extraction operations.

C. In coordination with Project sustainability goals, provide products with published Health Product Declarations (HPDs) that document the chemical inventory of the product to at least 0.1%.

2.3 ENVIRONMENTALLY PREFERABLE PRODUCTS

A. In coordination with Project sustainability goals, provide products with environmental impacts below the industry average in the following categories:
   1. Global warming potential
   2. Depletion of the stratospheric ozone layer
   3. Acidification of land and water sources
   4. Eutrophication
   5. Formation of tropospheric ozone
   6. Depletion of nonrenewable resources

B. In coordination with Project sustainability goals, provide materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 25% of the total value of the materials in the project.

C. In coordination with Project sustainability goals, ensure that products are sourced from manufacturers with third-party validated health, safety, and risk program.

D. In coordination with Project sustainability goals, provide products and materials that promote good indoor environmental quality (EQ) and promote efficiencies in operational performance.

E. In coordination with Project sustainability goals, provide materials and products that are sourced within 100 miles of the project site.

2.4 MANUFACTURED UNITS

A. Metal deck units shall comply with the Specifications of the Steel Deck Institute.

B. Design units for required spans and conditions of continuity, generally for 3 continuous spans, except as required by layout.

C. Stresses under construction loads, gravity loads and wind loading shall not exceed recommendations of the Steel Deck Institute.

2.5 FABRICATION

A. Fabricate in lengths as long as practical and piece-mark bundles for identification during erection.

B. Painting:
   1. Thoroughly clean deck and coat both sides with phosphate prior to painting.
   2. Apply paint .30 mils minimum thickness to both sides of deck and heat cure for tough, abrasion-resistant finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not lay deck units in place until supporting structure is secured in place and final connections are complete.

B. Layout deck units in accordance with shop drawings, do not stretch or bend units.

C. Overlap ends a minimum of 2 inches. Interlock side laps as shown on shop drawings.

D. Connections:
   1. Anchor deck to supporting steel with full-fusion puddle welds. Use weld washers where required.
   2. Connect side laps with screws or welds.
   3. Side lap connections of interlocking edges shall be made by button-punching with a specially designed crimping tool.

E. Weld metal fillers and closure pieces in place.

3.2 FIELD QUALITY CONTROL

A. Laboratory Testing and Inspection:
   1. Inspect condition of deck units for damage and corrosion.
   2. Inspect connections of deck to structure and at side laps.

3.3 ADJUSTING

A. Touch-up scarred areas on both sides of deck including welds, rust spots and abrasions by wire-brushing and painting with shop paint.

B. Repair blow-holes at welds with 18 gage plates welded in place. Replace entire sections of deck where holes cannot be satisfactorily repaired.

3.4 HANGERS FOR MISCELLANEOUS EQUIPMENT

A. Do not attach hangers for ceilings, ductwork, or piping directly to metal roof deck.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Lightgage structural metal studs in exterior wall systems used as masonry veneer back-up.

B. Related Sections:
1. Section 05 12 00 - Structural Steel Framing.
2. Section 05 50 00 - Metal Fabrications: steel angles.
3. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System.
4. Section 09 21 16 - Gypsum Board Assemblies: non-loadbearing partition studs and gypsum sheathing.

1.2 SYSTEM DESCRIPTION

A. Masonry Veneer: The exterior non-load-bearing curtain wall system shall be designed to withstand both positive and negative pressure with a maximum deflection of L/600 of stud span. If stud span for 6" and 8" 18 gage stud exceed L/600, either increase stud gage, decrease stud spacing, or add light-gage bracing to control deflection to L/600.

B. All Other Veneer/Cladding: The exterior non-load-bearing curtain wall system shall be designed to withstand both positive and negative pressure with a maximum deflection of L/240 of stud span. If stud span for 6" and 8" 18 gage stud exceed L/240, either increase stud gage, decrease stud spacing, or add light-gage bracing to control deflection to L/240.

1.3 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include manufacturer's specifications, load tables, dimension diagrams, anchor details, installation instructions for products to be used in lightgage framing work, and type and location of fasteners. Describe materials and finish, product criteria, and limitations.

B. Structural Calculations: Submit structural calculations prepared by manufacturer for review by project engineer.
1. Description of design criteria.
2. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
3. Selection of framing components and accessories.
4. Verification of attachments to structure and adjacent framing components.
5. Sealed by a professional engineer registered in the state where the project is located.
6. Engineer shall have a minimum of 5-years' experience with projects of similar scope.

C. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Drawings shall incorporate fabrication and erection details.

1.4 QUALITY ASSURANCE

A. All structural members shall be designed in accordance with AISI "Specifications for the Design of Cold-Formed Steel Structural Members", latest edition.

B. Qualifications: Welders and welding procedures shall comply with the requirements of ANSI/AWS D1.3 Structural Welding Code.

1.5 DELIVERY AND STORAGE

A. Protect metal members from rusting and damage. Deliver to project site in manufacturer's containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry, ventilated space.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lightgage Steel Framing: Basis of Design ClarkDietrich Building Systems (phone 800.543.7140 web site: www.clarkdietrich.com). ASTM A 1003, Provide Metal Framing, 18 gage minimum with 1-5/8" flange minimum, structural stud framing members. Refer to structural drawings for specific size, type, and locations of framing which may be used on the project.

B. Substitutions: Under provisions of SECTION 01 62 00 - PRODUCT OPTIONS. Other acceptable manufacturer's with products of equal substance and function include:
CEMCO Steel
Marino\Ware
The Steel Network

C. Furnish bridging and bracing members shown or required for a complete and structurally sound installation.

D. Track: Formed steel; channel shaped; same width and finish as studs, tight fit; 18 gage thick, solid web.

2.2 ACCESSORIES

A. Slide Clips: ASTM A 653, Grade A, galvanized metal clip.
1. ASTM A 653, Grade C, galvanized metal clip.
2. Designed and manufactured for attachment of metal stud framing to edge of structural steel framing.
3. Permits differential vertical movement between stud and floor or roof structure.
4. Clip and its connection to structure shall be adequate to safely brace metal studs to resist design lateral load of at least 330 pounds (allowable stress increase permitted by Building Code already taken into account).

B. Bracing and Furring: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Bridging: 1-1/2" C.R. channels, 16 ga; same finish as framing members.

D. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

E. Galvanizing Repair Paint: Organic Zinc-Rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to Federal Specification DOD P-21035A for repair of hot-dip galvanizing; as manufactured by ZRC Worldwide (phone 800.831.3275 web site: www.zrcworldwide.com). Provide Z.R.C. Cold Galvanizing Compound.

F. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

G. steel-framing accessories from ASTM A 1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

H. Slotted Top Track: Sliptrack Systems, SLP-TRK®, (phone 888.475.7875 web site: www.sliptrack.com).
1. 16 gage, ASTM A 653, Grade 50 with a minimum yield point of 50,000 psi.
2. 2-1/2" down-standing legs with 1/4" wide by 1-1/2" high slots spaced at 1" on center.
3. Track width shall match stud size by manufacturer's standard length.
4. Fasteners: ASTM C 1002, self-drilling, self-tapping screws**.**

2.3 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM A 90, hot dip galvanized.

B. Anchorage Devices: Power driven as recommended by manufacturer for size and spacing.

C. Welding Electrodes: Comply with AWS standards D1.1 and D1.3.

2.4 FABRICATION

A. General: Framing components may be prefabricated into panels prior to erection. Cut framing components accurately to fit squarely against abutting members. Hold members firmly in position until properly fastened. Prefabricated panels shall be square and braced against racking. Attach similar components by welding.

B. Protective Finishing: Paint abraded surfaces and welds after fabrication, using galvanizing repair paint for galvanized surfaces.

2.5 FINISHES

A. All framing members shall be formed from hot-dip galvanized steel, G60 coating, conforming to the requirements of ASTM A 653, Grade C.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel framing members and accessories in accordance with the manufacturer's instructions and the erection drawings. Spacing of studs shall not exceed 16" o.c.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

C. Securely anchor track to floor and overhead structure or member. Seat studs squarely in the track with the stud flange securely attached to the flanges of both upper and lower track.
1. Attach structural components by welding, bolting or with self-drilling screws.
2. Wire tying of framing components in structural applications will not be permitted.

D. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thinness of 2.0 mils. For galvanized surfaces, apply galvanizing repair paint.

E. Construct corners using minimum three studs. Double stud at wall opening, door, and window jambs.

F. Provide vertical stud within 12 inches of jamb for brick anchor attachment at openings. Reference BIA Technical Note 28B.

G. Provide rows of horizontal bridging welded in place at spacing recommended by stud manufacturer to resist lateral forces and stud rotation.

H. Slotted Top Track: Install slotted track in strict accordance with manufacturer’s written instructions and recommendations.
1. Secure studs to slotted top track with #8 wafer-head screws.
2. Maintain minimum deflection gap of 0.65 inch between top of stud and top of slotted track.
3. Limit vertical movement to 1 inch, plus or minus 1/2 inch**.**

3.2 TOLERANCES

A. Maximum Variation from True Position: ±1/8" from plan location.

B. Maximum Variation of any Member from Plane: 1/8" in 10 feet.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Miscellaneous metal work and related items.

B. Related Sections:
1. Section 05 12 00 - Structural Steel Framing.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Stairs: Provide metal stairs and support connections capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Live Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails:
a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 250 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Top Rails of Guards:
a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 250 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill of Guards:
a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

1.3 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include details of each metal fabrication, including setting drawings for anchor bolts and other required anchors.

B. Submit structural calculations prepared by manufacturer for review by project engineer. Shop drawings and calculations shall be sealed by a professional engineer registered in the State of Texas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: ASTM A 36, shapes, plates and bars.

B. Threaded Fasteners: ASTM A 307, Grade A, bolts and nuts.

C. Stud Anchors: Provide headed stud anchors with a smooth shank of carbon steel with a minimum tensile strength of 60,000 psi, as manufactured by Nelson Stud Welding Div. or KSM Welding Systems Div.

D. Expansion Bolts: Fed. Spec. FF-S-325, Group II, Type A, Class 1. Provide Hilti Kwik-bolt or Ramset Trubolt stud anchors.

E. Galvanizing Repair Paint: Organic Zinc-Rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to Federal Specification DOD P-21035A for repair of hot-dip galvanizing; as manufactured by ZRC Worldwide, Marshfield, MA (phone 800.831.3275 web site: www.zrcworldwide.com). Provide Z.R.C. Cold Galvanizing Compound.

F. Stainless Steel: Grade and type designated below for each form required:
1. Pipe: ASTM A 312, Grade TP 304.
2. Tubing: ASTM A 312, Grade MT 304.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Plate and Sheet: ASTM A 240 or ASTM A 666, Type 304.
5. For stainless steel railings, provide fasteners fabricated from type 304 stainless steel.

2.2 FABRICATION

A. Fabricate and assemble metal work in the shop to the greatest extent possible.
1. Metal surfaces shall be clean and free of mill scale and rust pitting, well-formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean true lines and surfaces. Exposed ends and edges shall be milled smooth with corners slightly rounded.
2. Weld shop connections to the extent practical; finish exposed welds smooth. Weld joints shall be flush.
3. Cut, drill or punch holes; do not make or enlarge by burning. Provide holes where required for connecting the work of other trades.
4. Conceal fastenings where practical. Thickness of metal and method of assembly and support shall give ample strength and rigidity.
5. Assemble parts so that joints are tight, members are in good alignment, and the finished work reproduces the drawing details as intended.
6. Stud Anchors: Weld stud anchors to miscellaneous shapes using welding equipment and procedures recommended by the manufacturer of the stud anchors used.

B. Shop Painting:
1. Carbon steel surfaces shall be cleaned, degreased, and shop coated with a straight alkyd, zinc chromate, rust inhibitive paint applied by brush or spray. Steel to be encased in concrete need not be painted.
2. Aluminum surfaces to be in direct contact with concrete and masonry shall be shop coated with zinc chromate primer.

C. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip ⅛" thick and heavier, and for galvanizing assembled steel products.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Deliver, store and erect metal work in such manner that the parts are not damaged or deformed. Install the work true to line, plumb, level, in proper alignment with other work, and free of sags, buckles and other objectionable defects. Anchorage shall be adequate to safely resist all stresses to which the work will normally be subjected.

B. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils. For galvanized surfaces, apply galvanizing repair paint.

3.2 MISCELLANEOUS METAL SCHEDULE

A. General: The following is a general list of the metal work to be furnished under this section of the specifications. Other items of miscellaneous metal work shown and noted on the drawings and not mentioned elsewhere in the specifications shall be furnished as though specifically described herein.

B. Loose Lintels: Lintels of steel shapes and plates where required at exterior brick veneer and as detailed.
   1. End bearing shall be at least 8".
   2. Where steel lintels are not specifically called out, furnish at least one steel angle for each 4" thickness of masonry in the wall.
   3. Wrap bearing ends of lintels with flashing to achieve a bond breaker between the lintel and the masonry.
   4. Galvanize steel lintels located in exterior walls, ready for prime and painting.

C. Exterior Pipe Rails: Handrails and railings of standard black steel pipe with fittings as detailed.
   1. Bend pipe to smooth curves without kinks. Make joints and connections flush and smooth. Grind rough edges and exposed welds smooth; dress to profile.
   2. For railings, space the posts as shown but not more than 4 ft. apart. Install posts into pipe sleeves set in the concrete; grout each post tight with low viscosity epoxy grout.
   3. Provide slip flanges where posts are set into concrete and where rails terminate against walls.
   4. Railings shall be designed and installed to meet the TAS requirement of withstanding 250 lbf. pressure applied in any direction at any point on the railing.
   5. For wall mounted handrails, provide malleable iron brackets having the mounting hole countersunk for a flat head machine screw to finish flush with the surface. Space brackets not more than 4 ft. apart. Fabricate returns from plates and welding elbows. Anchor returns and brackets with built-in anchor plates.
   6. Handrails shall extend a minimum of 12" beyond the top riser of a stair and the top and bottom of a ramp. Handrails shall extend one tread width beyond the bottom riser of a stair.
   7. Galvanize exterior pipe handrails and railings after fabrication, ready for prime and painting.

D. Roof Curbs: Fabricate curbs of steel angles, channels and plates at roof openings for ducts, exhaust fans and other set-on items.
   1. Miter and weld corners.
   2. Bolt or weld curbs to roof framing members.

E. Storefront Bracing: Provide braces of steel angles, channels and plates to reinforce and stiffen the head of the aluminum storefront framing.

F. Ladders: Fabricate ladders of steel bars and shapes.
   1. Weld all connections.
   2. Bolt ladders to floor and wall with steel brackets and clips.
   3. Ladder Rungs: Provide SlipNOT®, grit-free, mill finish steel Grade #2 – Medium rungs as manufactured by the W.S. Molnar Company (1-800-SlipNOT) or approved equivalent. Reference drawings for dimensions. Steel shall incorporate an anti-slip primarily martensitic steel surface covering 100% of the substrate consisting of a random hatch matrix with a surface hardness between 55 – 63 on the Rockwell “C” scale and a surface to substrate bond strength of at least 4,000 psi. The non-slip surface shall have a minimum coefficient of friction of 0.8 and be listed as slip resistant by Underwriters Laboratories.
   4. Galvanize exterior ladders after fabrication. Reference Manufacturer’s galvanizing guidelines, as to not damage the anti-slip surface. Make ready for prime and paint.

G. Bollards: Provide bollards of size indicated, extend 3' below grade and 4' above grade, fabricated of Schedule 40 steel pipe, galvanized with G90 coating. Fill bollards with 3000 psi concrete, finish with domed top.
   1. At existing slabs, fabricate bollards with 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

H. Roof Edge Angles: Provide steel angles along roof edges to support wood nailers.
   1. Weld angles to steel framing unless otherwise indicated.

I. Miscellaneous Steel Shapes: Channels, wide flange shapes, angles, plates, tubing, connections, and bolts where shown and detailed on Drawings. Hot-dip galvanize where exposed to weather or touching exterior masonry after fabrication. Set mechanical unit frames directly on joists, not on deck. Provide an angle frame supported by structure around all roof penetrations including hatches and ductwork.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wood blocking and nailers, wood furring and grounds, plywood sheathing, subflooring and plywood backing panels.

B. Related Sections:
   1. Section 06 40 00 - Architectural Woodwork.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data:
   1. Include all data for rough carpentry products required for installation.
   2. Fire-retardant-treated wood product data, including certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

C. Warranty: Provide warranty of chemical treatment manufacturer for each type of treatment.

1.3 QUALITY ASSURANCE

A. Lumber Grading: Lumber Grading Rules and Wood Species in accordance with Voluntary Product Standards. Grading rules of following associations apply to materials furnished.
   1. Southern Pine Inspection Bureau (SPIB).
   2. West Coast Lumber Inspection Bureau (WCLIBB).
   3. Western Wood Products Association (WWPA).

B. Grade Marks: Identify lumber and plywood by official grade mark.
   1. Lumber: Include symbol of grading agency, mill name, grade, species, grading rules and condition of seasoning at time of manufacturer.
   2. Plywood: Include type, span rating or group number, exposure durability classification, and agency mark of APA.

1.4 QUALIFICATIONS

A. Design structural site fabricated items under direct supervision of a professional structural engineer experienced in design of this work and licensed in the State of Texas.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store products above ground, on platforms or skids, and covered with waterproof coverings. Provide for adequate air circulation.

C. Do not store seasoned materials in damp or wet locations.

D. Support products in such a way as to prevent warping and distortion.

1.6 WARRANTY

A. Provide a 20-year warranty for each type of chemical treatment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood: Lumber for framing and general carpentry work shall be sound, well manufactured, surfaced S4S material with a moisture content limit of 19%.
   1. Dimension: SPIB grade marked No.2 Dimension Southern Pine or WCLB grade marked No. 2 Dimension Douglas Fir.
   2. Boards: SPIB grade marked No. 2 Boards Southern Pine.
   3. Redwood: RIS grade marked Construction Heart California Redwood.

B. Plywood: Plywood for general carpentry work shall be APA trademarked, 23/32" minimum thickness, Tongue & Groove.
   1. Interior: APA Rated Sturd-I-Floor, 24 oc, Exposure 1, fire-retardant treated.
   2. Exterior: APA Rated Sturd-I-Floor, 24 oc, Exterior, fire-retardant treated.

C. Rough Hardware:
   1. Anchors, bolts, screws, and spikes shall be of proper types and sizes to support the work, to draw the members into place, and to hold them securely. Bolt heads and nuts bearing on wood shall have standard washers.
   2. Metal fasteners to secure wood grounds and blocking to masonry and concrete shall be of the type best suited to the conditions and spaced no more than 16" o.c. Wood plugs and nailing blocks are not acceptable.
   3. Nails shall be of the sizes and types intended for the particular use.
   4. Rough hardware exposed to the weather or embedded in exterior masonry and concrete walls or slabs shall be galvanized.
   5. Nails and bolts used with preservative treated lumber shall be galvanized.

2.2 WOOD TREATMENT

A. Preservative Treatment:
   1. Comply with applicable requirements of AWPA U1; Category UC2 for interior construction not in contact with ground, Category UC3b for exterior construction not in contact with ground, and Category UC4a for items in contact with ground.
      a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
      b. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
   2. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19% for lumber and 15% for plywood. Do not use material that is warped or that does not comply with requirements for untreated material
   3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

B. Fire-Retardant Treatment:
   1. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   2. Wood shall be fire-retardant chemically treated and pressure impregnated; with a flame spread index of 25 or less and a smoke development of 0-450 when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   3. Treatment shall not promote corrosion of metal fasteners.
   4. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   5. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   6. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841

7. Kiln-dry lumber and plywood after treatment to maximum moisture content of 19% for lumber and 15% for plywood.
8. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

C. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber or plywood after drying; discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
1. Discard units of material with defects which might impair quality of work, and units which are too small to fabricate work with minimum joints or optimum joint arrangement.
2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Scribe and cope as required.
3. Securely attach carpentry work to substrates by anchoring and fastening as required by recognized standards and as required to draw members into place and securely hold same unless otherwise indicated. Use washers under all bolt heads.
4. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
5. Make tight connections between members to develop full strength of members.
6. Install fasteners without splitting of wood.
7. Pre-drill as necessary.
8. Comply with APA E30 requirements for plywood.
9. Install fasteners at spacings recommended by AFPA National Design Specifications for Stress Grade Lumber and Its Fastening - 1973 for lumber and APA Guide E30 for Plywood, unless more restrictive code requirements dictate tighter spacing or heavier fasteners.
10. Locate members as indicated on the drawings. Size, spacing or spans shall not be changed without specific approval of Architect. Take care to place proper grades and species of members where indicated in accordance with the lumber schedule herein.
11. Temporary brace framing at the end of each days' work until all framing is completed and securely anchored. Leave temporary bracing in place as long as required for safety. As work progresses, securely connect work to compensate for dead load, wind and erection stresses.

B. Shoring: Construct shoring for masonry where required. Brace and maintain it until the mortar has set sufficiently to permit removal.

C. Blocking: Install 2x6 wood blocking between studs to stiffen the structure and for the support of other work. Provide 2x6 blocking for installation of wall-mounted objects.

D. Nailers: Install nailers of adequate size where detailed. Nailers shall be bolted in place. Where bolt sizes and spacing are not specifically noted, use not less than ⅜" bolts at 32" o.c., staggered.

E. Roof Curbs: Construct wood curbs as detailed to frame openings and support flashings in roof decks.

F. Bucks: Install wood bucks for frames as required. Members shall be at least 2 x 4 material. Spike securely together. In masonry, provide 16 ga. corrugated metal jamb anchors screwed to the back and spaced to work masonry bed joints, not more than 32" apart.

G. Plywood Backing Panels: Screw attach through gypsum board to supports.

3.2 PROTECTION

A. Protect products from moisture absorption and subsequent warping or deterioration until subsequent construction can proceed.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concealed mastic dampproofing in masonry walls. Refer to schedule at end of section.

B. Related Requirements:
1. Section 04 20 00 - Masonry Units.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Indicate properties of products, performance characteristics, proposed use, and certifications that product meets or exceeds standards.

C. Manufacturer's Instructions: Including application instructions, precautions, material safety, and methods of attachment/embedment into substrate data sheets.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual, and manufacturer's instructions, whichever are more stringent.

B. For interior and concealed in all applications, provide product certified by manufacturer to be substantially odor-free within 24 hours of application.

1.4 QUALIFICATIONS

A. Applicator Qualifications: Company experienced in application of dampproofing with 3-years experience on similar sized projects.

1.5 FIELD SAMPLES

A. Provide 4 x 6 foot field sample of mastic dampproofing under provisions of SECTION 01 45 00 - QUALITY CONTROL illustrating application techniques and material thickness.

B. Sample may be incorporated as part of work if approved in writing by Architect.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING PROTECTION.

B. Do not allow products to become frozen.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperature above 40°F. for 24 hours before application and continuously until mastic dampproofing has cured.

B. Do not allow dampproofed surfaces to be exposed to prolonged sunlight.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate installation in accordance with SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Do not begin work until substrate preparation is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mastic: ASTM D 1227, Type II, Class 1, semi-mastic asphaltic emulsion reinforced with non-asbestos fibers. Product/manufacturer; one of the following:
920AF Fibered Emulsion Mastic; Karnak
Sealmastic; W.R. Meadows, Inc.
MasterSeal 615; Master Builders Solutions by BASF

B. Substitutions: Submit in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 ACCESSORIES

A. Mastic Dampproofing:
1. Emulsion Based Dampproofing: Non-asbestos fiber reinforced emulsion asphaltic compound, brush or spray consistency, meeting requirements of ASTM D 1227 or FS-4-1781.
2. Reinforcing Mesh; Treated glass fabric, woven design, 20 x 10 mesh.
3. Plastic Cement: Type recommended by manufacturer and compatible with dampproofing product, for trowel consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Do not apply when surface of ambient temperature is below 40°F., during inclement weather, or if surface is damp, dirty, or dusty.

C. Verify surfaces are solid and free of cracks, pits, rough or sharp projections.

D. Verify items which penetrate surface to receive dampproofing are securely anchored.

3.2 PREPARATION

A. Remove rough or sharp projections, loose particles, and foreign matter detrimental to adhesion and application of dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's written instructions.

C. Apply two coats of plastic cement and one layer of reinforcing mesh (between plastic cement coats) to seal penetrations, small cracks, and at other areas as recommended by manufacturer.

D. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at control joints.

3.3 INSTALLATION

A. Mastic Dampproofing: For application over concealed masonry, concrete surfaces within walls.
1. Clean surfaces of excess mortar and loose dirt and apply the mastic in two coats by brush or spray. Allow the first coat to dry tacky before applying the second coat.

2. Coverage shall be approximately 35 sq.ft. per gallon per coat. Fill in crevices and grooves and around projecting anchors and joint reinforcement. Make sure that coating is continuous and free from breaks and pinholes.
3. At glass-mat gypsum sheathing, apply dampproofing prior to installation of masonry anchors.

3.4 FIELD QUALITY CONTROL

A. Tests: Periodically (not less than once per 100 sq.ft. of surface area) check application thickness to verify compliance with specified thickness. Immediately re-apply if found to be deficient.

3.5 PROTECTION

A. Protect finished installation under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

B. Protect adjacent surfaces not to receive dampproofing against "overspray" or "over brush".

C. Protect dampproofing against damage during backfilling with adhered protection course, neatly fitted around projections and penetrations. Do not apply until dampproofing has thoroughly cured.

D. Protect flashing until placement within wall is complete. Do not allow wind to displace or damage flashing.

3.6 CLEANING

A. Perform final cleaning under provisions of SECTION 01 74 13 - PROGRESS CLEANING.

3.7 DAMPPROOFING SCHEDULE

A. Dampproof as follows with mastic:
1. Over the exterior surfaces of the inside wythe of masonry and concrete backup in below-grade exterior cavity walls to provide an unbroken dampproofing barrier.
2. Over the inside wythe of masonry and concrete backup in non-conditioned buildings or dumpster walls.
3. Elsewhere where indicated.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Thermal and fire safing building insulations.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 07 11 13 - Bituminous Dampproofing.
3. Section 07 27 26 - Fluid-Applied Membrane Air Barriers
4. Section 07 53 00 - Single-ply Membrane Roofing; roof insulation.
5. Section 07 65 00 - Flexible Flashing
6. Section 07 84 00 - Firestopping.

1.2 SUBMITTALS

A. General: Submit following items under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Including performance specifications, composition and applicable standards.
2. Product Test Reports: For each product, for tests performed by a qualified testing agency.
3. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

C. Samples: Submit 12" x 12" size samples of each type insulation proposed for use.

D. Manufacturer's Instructions: Written installation instructions, including attachment recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: (See Articles below for specific products)
Dow Chemical Company
Fibrex Co.
Manville Building Materials Marketing Division, Manville Corp., Denver, CO
Owens Corning Fiberglas Corp., Toledo, OH
Certainteed Corp., Valley Forge, PA
U.S. Gypsum Co.

2.2 BATT THERMAL INSULATION

A. Glass fiber composition, unfaced, minimum one lb./c.f. density, meeting following standards:
1. ASTM E 84: FHC 25/50 maximum.
2. ASTM C 518: R value of 3.2 per inch of thickness.
3. ASTM C 665: Type I and Type III, Class A.

B. Following products are acceptable:
1. Unfaced Thermal Batts by Owens Corning Fiberglas Corp.
2. Unfaced Building Insulation by Certainteed Corp.
3. Unfaced Building Insulation by Manville Corp.

2.3 RIGID/SEMI-RIGID INSULATION

A. Insulation: Basis of Design: Provide Thermafiber RainBarrier HD Insulation as manufactured by Thermafiber, Inc., Wabash, IN (phone: 888-834-2371; web: www.thermafiber.com (an Owens Corning company)
   1. Description: Non-combustible, semi-rigid mineral wool insulation board that is water repellent and resists temperatures above 2,000° F, meets ASTM C 612, IVA**.**
   2. Thickness: As noted on contract drawings.
   3. Type:
      a. R-value of 4.3 per inch.
      b. Facing: Unfaced.
      c. Density: 6.0 pcf.
      d. Surface Burning Characteristics: Unfaced-Flame Spread 0 and Smoke Developed 0
      e. Moisture Resistance: Absorbs less than 0.03% by volume, ASTM C 1104.
      f. Non-corrosive, ASTM C 665.
      g. Recycled Content Options:
         Pre-consumer recycled content:
            Special “Green” Fiber……..…..90%
            Dark Fiber Mineral Wool Products……..…84%
            EPA Choice Fiber (US Government Buildings)…….75%
            Standard Mineral Wool Products..……..…70%
         Post-consumer recycled content…….....0%

2.4 FIRE SAFING INSULATION

A. Mineral fiber composition, 4" thick, 4.0 pcf density, meeting following standards
   1. ASTM E 84: FHC 15/10 maximum.
   2. ASTM C 665: Type I, Class A
   3. ASTM E 119: Testing Procedures.
   4. FS HH-I-558B: Class 1 and 2.

B. Following products are acceptable
   1. Thermafiber Safing Insulation by U.S. Gypsum Co.
   2. FBX Safing Insulation by Fibrex Co.

2.5 ACCESSORIES

A. Joint Tape: Pressure sensitive type, recommended by insulation manufacturer.

B. Insulation Adhesive: Type recommended by insulation manufacturer.

C. Stick Clips
   1. Galvanized sheet metal with impaling pins and retainer washers.
   2. Size and type to suit application and insulation thickness.
   3. Approved by manufacturer of insulation for intended use.

D. Stick Clip Adhesive
   1. High strength, resilient adhesive, having drying time of 0 to 30 minutes (rapid initial set), and 24 hours final set.
   2. Compatible with insulation adhesive, insulation and substrate.
   3. Non-corrosive to galvanized steel.

E. Supportive Wire Mesh: Hexagonal design, woven mesh "chicken wire" style.

F. Tie wire: Minimum 18 ga. annealed wire.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive insulation for conditions that will adversely affect the execution and quality of the work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Fit insulation tight within stud spaces, above soffits, behind fascias, and tight to and behind mechanical and electric services within plane of insulation, leaving no gaps or voids. Butt insulation tightly. Cut and fit tightly around items penetrating insulation. Stagger and butt joints, or cavity of a cavity wall system.

B. Install in conformance with the manufacturer's recommendations. Cut material to fit closely around obstructions and projections.
   1. Walls: Secure insulation by mechanical means to hold it in place without sagging or slumping. Install insulation with edges and joints butted tight to leave no gaps.
   2. Soffits: Insulation shall be laid between wire hangers on back of cement plaster and over cross runners. Sides and ends of adjacent batts shall be tightly butted together.

C. Applying Rigid Insulation: Install board insulation between the wythes in exterior masonry walls.
   1. In masonry walls place boards over the mastic dampproofing on the face of the backup masonry before the face brick wythe is laid.
   2. Securely fasten the board to the backup with mastic and suitable mechanical anchors where required to hold it firmly in place.
   3. In framed construction, apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
   4. Cut the material to fit snugly around obstructions and projections. Joints shall be tight.
   5. Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

D. Safing Insulation: Compress and install insulation on wire hangers or clips in spaces between floor slabs and curtain walls. Also, in openings in floor slabs to seal around telephone cables, piping, ducts and other utilities per SECTION 07 84 00 - FIRESTOPPING.

3.3 SCHEDULES

A. Provide R values for thermal insulation as indicated on the drawings.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Closed cell sprayed polyurethane foam insulation used at miscellaneous voids in thermal building envelope.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 21 00 - Building Insulation.
3. Section 07 27 26 - Fluid-Applied Membrane Air Barriers.
4. Section 07 53 00 - Single-ply Membrane Roofing.

1.2 SYSTEMS DESCRIPTION/QUALITY ASSURANCE

A. Contractor must use a total system, encompassing equipment, insulation, thermal barrier as supplied and tested by the manufacturer to meet IBC, IECC, and NFPA requirements. No substitutions may be made for tested systems.

B. Contractor must be licensed and trained by the manufacturer.

C. Manufacturer's qualified technical representative will be required to visit project site to advise Installer of procedures and precautions for installation of insulation materials and to verify installation requirements. Manufacturer's representative shall make inspection of the installation a minimum of three times. Manufacturer's written reports of findings shall be submitted for the Architect review.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data:
1. Submit data that the product meets or exceeds specified requirements.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.
5. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Certification:
1. Submit current Manufacturer’s Authorized Contractor Certificate.
2. Submit manufacturer's certificate that the product meets or exceed specified requirements.
3. Manufacturer's written certification that product contains no asbestos.
4. Submit the technical data sheet from the manufacturer showing the test results from the ASTM E84 (Surface Burning Characteristics).

D. Samples: Submit samples of each product specified.

E. Mock-Up:
1. A representative surface of not less than 100 square feet shall be sprayed and approved by the manufacturer and Architect prior to proceeding.
2. Finish areas designated by Architect.
3. Do not proceed with remaining work until installation is approved by manufacturer and Architect.
4. Rework mock-up area as required to produce acceptable work.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in original, unopened containers bearing name of manufacturer, product identification, safety information, and expiration date.

B. Store materials off ground, under cover and away from damp surfaces and keep material dry at all times.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction. Empty containers shall be removed from site on a daily basis.

1.5 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Ventilate insulation application area in accordance with the Spray Foam Coalition's Guidance on best practices for the installation of Spray Polyurethane Foam.

C. Protect workers as recommended by the Spray Foam Coalition's Guidance on best practices for the installation of Spray Polyurethane Foam.

D. Protect adjacent surfaces, windows, equipment and site areas from damage of overspray.

1.6 WARRANTY

A. Provide limited lifetime warranty. Manufacturer's sole responsibility under this Limited Lifetime Warranty shall be to repair or replace any defective Product.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The following installation contractors are approved on this project as trained and certified by the Air Barrier Association of America (ABAA) and have received Demilec SPF training and certification.
LCR, Dallas, TX, Devin James, 214-761-1940, DJames@lcrcontractors.com
Alpha IBP, Dallas, TX, Chuck Jahant, 972-446-2600, CJahant@alphaiwp.com
True Fireproofing, Tulsa, OK, Dustin Norman, 918-346-1009, dnorman@truefireproofing.com
1. Allowance will be made for additional installers, provided they submit their name, certification by the manufacturer, experience, and information showing their proficiency to the Architect at least one week prior to the bid. Approval or denial will be issued by addendum.

B. Basis of Design: ASTM C 1029, Type II, provide thicknesses to meet R-values as shown on the drawings, Heatlok Soy® 200 Plus foamed-in-place insulation as manufactured by DEMILEC USA®; 2925 Galleria Dr, Arlington, TX 76011. Toll Free Tel: (877) DEMILEC. Tel: (817) 640-4900. Web: http://www.demilecusa.com
1. Application with a prescriptive Thermal Barrier: Up to 9-1/4 inches for wall cavities with minimum 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4.
2. Interior applications without a thermal or ignition barrier (exposed foam) shall include BLAZELOK TBX intumescent coating. Passes NFPA 285 testing as part of an approved assembly.
3. Physical Properties:
   a. Density (ASTM D 1622): 2.1 lb/cf.
   b. Thermal Resistance (ASTM C 518): Aged R value at 1 inch (180 days at 76 degrees F) – R-7.4 (sf.h degree F/BTU)
   c. Water Vapor Permeance @ 1.2"(ASTME 96-05): < 1 perms (is a vapor barrier per IBC Section 202 definitions at 1.2")
   d. Air Permeance @ 75 Pa @ 1" (ASTME 2178-03): 0.02 L/sm2
   e. Air Leakage of Air Barrier Assembly (static loading to 600 Pa and gust loading to 1,200 PA) Complies with ABAA requirements (ASTME 2357-05): <0.02L/sm2
   f. Compressive Strength (ASTM D 1621): 28.7 psi (198 kPa).
   g. Tensile Strength (ASTM D 1623): 46.2 psi
   h. Off Gassing Test (VOC Emissions) (CGSB 51.23-92): Pass (no toxic vapor).
   i. Surface Burning Characteristics (ASTM E 84) 4 inches: Class I. Flame Spread Index 20, Smoke Developed Index 400.
   j. Closed Cell Content (ASTM D2856) : >90%

C. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

D. Accessories:
1. Joint Cover Membrane: Membrane at Tilt-Wall Joints, Transitions in Substrate, and Connections to Adjacent Elements shall be 40 mil, minimum 9 inches wide, Heatlok® ABS Membrane.
2. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

E. Water Based Intumescent coating: Only at interior applications without a thermal or ignition barrier (exposed foam), provide BLAZELOK™ TBX Intumescent Coating, Distributed by DEMILEC USA® and Manufactured by TPR^2.
1. Application: Follow manufacturer's application recommendations.
2. Physical Properties:
a. Approval: Complies with NFPA 101 paragraph 10.2.3.7.2 for use without a prescriptive thermal barrier.
b. Surface Burning Characteristics (ASTM E 84): Class I. Flame Spread Index <25, Smoke Developed Index <50.
c. Expands up to 2000 percent.
d. Flash Point: None
e. Volatility/VOC: < 50 g/L
f. Non-toxic, drain safe, water based, non-fuming.
g. Color: Dull Flat White / Gray. Wait minimum 24 hours prior to top coating with quality latex paint. Verify dryness with moisture meter.

PART 3 - EXECUTION

3.1 INSPECTION

A. The installing contractor shall examine all surfaces and report all unsatisfactory conditions in writing to the Contractor. The work shall not proceed until unsatisfactory conditions are corrected. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

B. Surfaces to receive spray insulation shall be inspected prior to application to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains. Prime accordingly.

3.2 PREPARATION

A. Provide masking, drop cloths or other satisfactory coverings for all materials/surfaces which are not to receive insulation so as to prevent damage from overspray.

B. Clips, hangers, fasteners, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Area shall be dried-in before spraying insulation.

3.3 INSTALLATION

A. Installation, clean-up and curing shall be accomplished according to the manufacturer's recommendations and common construction standards.

B. Peel off silicone release paper or film from joint cover membrane. Membrane must be adhered to wall a minimum of 3 inches wide on either side of the joint. Once installed, a pressure must be applied over the whole surface using a hard roller to ensure a perfect adhesion.

C. Apply insulation to substrate in sufficient thickness to achieve the required thermal value.

D. Spray insulation to envelop entire area to be insulated and fill voids.

E. Spray insulation on wall and continue onto deck 4” to seal to deck. Tape area on deck to achieve a straight line.

F. Apply in multiple passes to reach specified R-Value (-0 / +1/4) and not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

G. Miscellaneous Voids: Apply according to manufacturer's written instructions.

H. Provide natural or mechanical ventilation continuously to properly cure the insulation.

3.4 PROTECTION

A. Protect installed products from damage due to harmful weather exposures, physical abuse, and other causes until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 26 00

VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vapor barrier placed on masonite topping sheet.

B. Related Sections:
1. Section 03 11 00 - Concrete Forming and Accessories: Masonite topping sheet.
2. Section 03 30 00 - Cast-in-Place Concrete.
3. Section 07 62 00 - Sheet Metal Flashing and Trim: Vapor retarder at roof expansion joints.
4. Section 31 31 00 - Soil Treatment: Temporary polyethylene sheeting over treated soil.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Provide product data for each type of product.
2. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
3. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Barrier: Product/manufacturer; one of the following:
Ecoshield-E; Epro Services
Stego Wrap (15 mil) Vapor Barrier; Stego Industries, LLC
Xtreme (15 mil) Vapor Barrier; Tex-Trude, LP
Perminator (15 mil); W.R. Meadows

B. Vapor Barrier membrane shall have the following qualities:
1. Permeance of less than 0.01 Perms [grains/(ft2*hr*inHg)] as tested after mandatory conditioning tests ASTM E 154 (sections 8, 11, 12, 13) per ASTM F 1249 or ASTM E 96.
2. ASTM E 1745 Class A.
3. Minimum thickness 15 mils.

C. Accessories:
1. Seam Tape: High-density polyethylene tape with pressure sensitive adhesive. Minimum width 4 inches.
2. Pipe Boots (Penetrations of Vapor Barrier): Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.
3. Perimeter/edge seal: Provide the following as manufactured by Stego Industries LLC, (887) 464-7834 www.stegoindustries.com.
a. Stego Crete Claw
b. Stego Term Bar.
c. StegoTack Double-Sided Tape.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove soil treatment protective vapor barrier before placement of permanent vapor barrier.

B. Ensure that subsoil is approved by Architect and/or geotechnical engineer.

3.2 INSTALLATION

A. Install vapor barrier in accordance with manufacturer’s instructions and ASTM E 1643.

B. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete pour.

C. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the slab itself using perimeter/edge seal, such as Stego Crete Claw or termination bar and tape per manufacturer's instructions.

D. Overlap joints a minimum of 6" and seal with manufacturer’s seam tape.

E. Seal all penetrations (including pipes) with manufacturer’s pipe boot.

F. Turn edge of sheeting down face of perimeter grade beam a minimum of 6".

G. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.

H. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6" and taping all four sides with tape.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vapor-permeable, fluid-applied air barriers, which also function as water-resistive barriers.

B. Related Requirements:
1. Section 01 45 00 - Quality Control: for general mockup requirements.
2. Section 04 20 00 - Masonry Units; concrete unit masonry treatment.
3. Section 09 21 16 - Gypsum Board Assemblies: for glass-mat gypsum wall sheathing and wall sheathing joint and penetration treatments.

1.2 DEFINITIONS

A. Air-Barrier Material (AB): A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

D. Water-Resistive Barrier (WRB): Water-shedding barrier made of material that is moisture-resistant, and installed to shed water, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.
4. Consult air barrier manufacturer for additional installation guidelines and illustrations to assist with meeting shop drawing requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
1. Certification shall include statement that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use.
2. Certification shall include statement that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
   1. Build integrated mockups of exterior wall assembly, 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
      a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
      b. Include junction with roofing membrane**,** building corner condition, and foundation wall intersection.
      c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
   1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
   3. Water Penetration Testing: Mockups will be tested for water penetration according to ASTM E 1105.
   4. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541 (modified).
      a. Use a type II pull tester, except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material.
      b. Perform test after curing period recommended by the material manufacturer.
      c. Record mode of failure and area where the material failed in accordance with ASTM D4541.
      d. The inspection report shall indicate whether the specified adhesion requirement has been met.
   5. Compatibility Determinations: Mockups will be inspected for visual signs of decay, chemical attack, or degradation of any kind. Suspect instances shall be reported to the corresponding manufacturer who shall provide a letter that approves moving forward with the project or rejects the use of the product or rejects the method or circumstances of installation with an appropriate explanation of the position taken.
   6. Notify Architect seven days in advance of the dates and times when mockups will be tested.
   7. Perform the air leakage test and water penetration test of mockups prior to installation of cladding and trim but after installation of all fasteners for cladding and trim, and after installation of other penetrating elements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

C. Deliver materials to Project site in original packages with seals unbroken, labeled with material Manufacturer's name, product, date of manufacture, and directions for storage.

D. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by material manufacturer.

E. Handle materials in accordance with material manufacturer’s recommendations.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

B. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

C. Compatibility. Do not allow air barrier materials to come in contact with chemically incompatible materials.

D. Ultra-violet Exposure. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which air barrier manufacturer agrees to furnish and install air barrier material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
   1. Manufacturer’s Warranty Period: Five (5) years from Date of Substantial Completion.

B. Installer’s Warranty: Provide installer’s installation warranty, including all accessories and materials of the air barrier assembly, against failures including loss of airtight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.
   1. Installer’s Warranty Period: Two (2) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft**.**, when tested according to ASTM E 2357.

2.3 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 17 to 30 mils (0.4 to 0.8 mm) over smooth, void-free substrates.
   1. Basis of Design Product: Subject to compliance with requirements, provide Prosoco, Inc.; R-Guard Spray Wrap MVP (at medium-build thickness) or a comparable acrylic product by one of the following:
      Tremco, Inc.
      3M Industrial Adhesives and Tapes Division.
      DuPont Safety & Construction.
      GE Construction Sealants; Momentive Performance Materials Inc.
      Hohmann & Barnard, Inc.
      W.R. Meadows, Inc.
   2. Physical and Performance Properties:
      a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.

b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 120 days according to manufacturer's written instructions.
g. Fastener Sealability: No water infiltration when tested in accordance with ASTM D 1970.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Dow Corning Corporation.
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. Pecora Corporation.
d. Prosoco, Inc.
e. Tremco Incorporated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
   3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
   4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
   1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
   2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
   3. Where multiple prime coats are needed to achieve required bond or thickness, allow adequate drying time between coats.

B. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
   1. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 17 mils, applied in two equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
      a. Second coat shall be back rolled in accordance with manufacturer’s written instructions.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Air-barrier dry film thickness.
   3. Continuous structural support of air-barrier system has been provided.
   4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   5. Site conditions for application temperature and dryness of substrates have been maintained.
   6. Maximum exposure time of materials to UV deterioration has not been exceeded.
   7. Surfaces have been primed, if applicable.
   8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   9. Termination mastic has been applied on cut edges.
   10. Strips and transition strips have been firmly adhered to substrate.
   11. Compatible materials have been used.
   12. Transitions at changes in direction and structural support at gaps have been provided.
   13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
   14. All penetrations have been sealed.

B. Tests: As determined by testing agency from among the following tests:
   1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
   3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.
   1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
   2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
   2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 46 00

PREFORMED SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Preformed siding installed on the backside of parapets.

1.2 WARRANTY

A. Provide manufacturer’s 30-year limited paint warranty for film integrity and for fade and chalk.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Preformed Siding: Provide "PBU Panel" preformed corrugated panels as manufactured by Fabral. Panels shall be coated with silicone-modified polyester paint finish.
   1. Color as selected by Architect.

B. Fasteners: Manufacturer's standard non-corrosive type with exterior heads gasketed.

C. Accessories: Provide components required for a complete siding system, including trim, corner units, closure strips, ¾" 18 ga. sub-girts, and similar items. Match finish of preformed panel.

2.2 FABRICATION

A. Factory fabricate and finish panels and accessories. Panels shall be fabricated of not less than 26 ga. sheet steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with panel fabricator's instructions and recommendations for installation. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement.

B. Install panels with exposed fasteners.

3.2 CLEANING

A. Upon completion of panels installation, clean finished surfaces as recommended by panel manufacturer.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 53 00

SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fully adhered, UL Class A, factory applied white color finish, non-ballasted single-ply roofing system. Single-ply roofing system shall not have torch-sealed seam construction.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry: treated wood nailers, blocking, and curbs.
2. Section 07 62 00 - Sheet Metal Flashing and Trim.
3. Section 07 72 13 - Manufactured Roof Curbs and Portals.
4. Division 22 - Plumbing: roof drains.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Furnish manufacturer's printed specifications and instructions for installation of system.
2. Include procedures and materials for terminations, flashing, splicing, expansion joints, and bonding.

C. Shop Drawings shall indicate:
1. Roof configuration.
2. Design of tapered insulation system showing layout, slope and thickness of entire system.
3. Sheet layout.
4. Location of field splices.
5. Type of splices.
6. Mechanical equipment flashing.
7. Expansion joints.
8. Termination details.
9. Penetration details.
10. Parapet wall details.
11. Roof slopes.
12. Cricket locations.

D. Samples:
1. Submit a 12" x 12" sample of membrane material.
2. Submit a sample of each type of fastener.
3. Submit a 12" x 12" sample of cover board.

E. Certificates:
1. Submit manufacturer's certification stating materials ordered and supplied are compatible with each other, suited for locale and purpose intended, and shipped in sufficient quantity to ensure proper, timely installation.
2. Submit manufacturer's approval of proposed fasteners.
3. Submit manufacturer's approval of installer.
4. Submit installer's experience record.
5. Certify materials shipped to site meet membrane manufacturer's published performance requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Obtain primary sheet roofing materials from a single manufacturer.
2. Provide secondary materials as recommended in writing by manufacturer of primary materials.

3. Manufacturer's qualified technical representative will be required to visit project site to advise Installer of procedures and precautions for installation of roofing materials and to verify warranty inspection requirements. Manufacturer's representative shall make inspection of the membrane installation a minimum of three times. Manufacturer's written reports of findings shall be submitted for the Architect and Owner's review.
4. Provide primary products, including each type of flexible sheet roofing and sheet flashing produced by a single manufacturer, which has produced that type product successfully for not less than 5 years. Provide accessory products which are acceptable to manufacturers of primary products.

B. Applicator Qualifications: Five years successful experience in installation of roofing systems similar to system for this project and approved by membrane manufacturer. Similar in system shall be experience with same type, same insulation, same substrate, and same method of attachment. Insulation applicator and application method shall be approved by the manufacturer of the single-ply roofing materials to be installed.

C. Wind Up-lift Requirements: Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressures calculated according to ASCE 7-10 and based on a 3-second gust of 120 miles per hour.

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Compatibility of Roofing System: Roof insulation, roof crickets and tapered insulation roof system shall be compatible with the roofing materials to be used and shall be approved by the manufacturer of the singly-ply sheet roofing materials.

F. Provisions for Expansion: If in the manufacturer's or installer's expert opinions, the roofing area is large enough to require expansion joints, then they are to be provided, whether shown on the construction documents or not. Contractor shall consult with the Architect regarding the exact joint locations.

G. Pre-roofing Conference:
1. At least one week prior to start of roofing installation, convene pre-roofing conference at project site.
2. Attendance is required by Contractor, installer, manufacturer's technical representative, Architect, and effected subcontractors, i.e. mason, electrical, and plumber.
3. Review requirements for work and conditions which could possibly interfere with successful performance of work.
4. Minimum Formal Written Agenda:
    a. Review project specifications and drawings.
    b. Review weather and working conditions.
        1) Substrate requirements.
        2) Insulation installation.
        3) Membrane installation.
        4) Roof terminations, flashings, and roof drain requirements, including roof drain location, i.e. minimum distance from parapets allowed by roofing membrane manufacturer. Coordinate reglet location.
        5) Mechanical equipment placement, supports, and height requirements.
        6) Inspection, testing, and quality control procedures.
        7) Protection requirements for construction period beyond roofing installation.
        8) Procedures for making roof penetrations after membrane installation.
        9) Water cutoffs at end of day's work.
5. Conduct tour of roof deck; report discrepancies and problem areas to Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened packaging with legible labels intact.

B. Store materials on site in enclosures or under protective coverings off ground.

C. Insulation stored on the site shall be raised above deck or ground level on pallets and covered with waterproof tarpaulins or plastic sheeting.

D. Do not store material in or on building in such concentrations as to impose excessive strain on deck or structural members.

1.5 PROJECT CONDITIONS

A. Weather:
   1. Proceed with roofing work when existing and forecasted weather conditions permit performance in accordance with manufacturer's recommendations and warranty requirements.
   2. Take special precautions as recommended by manufacturer when applying roofing below 40°F. Ensure cements, adhesives, mastics, and coatings are not affected by freezing weather.

B. Protection: Protect finished surfaces of the building from damage and staining during the installation work with suitable covers.

C. Contractor shall clean roof on a daily basis. Remove construction debris which could harm the membrane. Construction material spillage must be removed without harming the membrane. If spillage cannot be removed satisfactorily, remove and replace the damaged membrane.

D. Smoking on the roof during installation shall not be allowed.

E. Roof membrane shall be cleaned for the removal of all stains following installation. Cleaning to be performed in accordance with manufacturer's recommendations.

1.6 WARRANTY

A. Furnish written 20-year, no dollar limit (NDL), warranty of materials and workmanship for watertightness extended to include but not be limited to flashings, seams, membrane, penetrations, and pitch pockets.

B. Warranty shall be signed by membrane manufacturer, agreeing to repair or replace defects in material or workmanship and failure of roof to resist water penetration for period of 20 years from substantial completion of project. Warranty shall be furnished without financial limitation based on initial installation cost or inclusion of other financial constraints that would limit manufacturer's repair or replacement costs during warranty period.
   1. Project shall be installed in such a manner that the roofing material manufacturer will furnish a written twenty (20) year NDL type warranty with no exclusion for hail events containing hail stones up to and including two inches (2") from the date of substantial completion of the completed project. Manufacturer issuing warranty shall provide historical data supporting hail resistance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Product/manufacturer; one of the following:
   EverGuard® PVC Roofing System; GAF Materials Corp.
   JM PVC; Johns Manville

2.2 INSULATION MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both surfaces. Polyisocyanurate insulation shall be a minimum 2-layers and shall meet or exceed the requirements of ASTM C 1289, with the following characteristics:
   1. Thermal Resistance (LTTR value) of: Minimum of 2-layers with a Total minimum value as shown on drawings.
   2. Compressive Strength: 20 psi

B. Cover Board: ASTM C 1177, glass-mat, water-resistant gypsum substrate as manufactured by G-P Gypsum Corporation. Provide 1/2-inch thick DensDeck® Prime Roof Board over insulation.

C. Crickets and Cants: Provide crickets and cants at locations as shown. Cricket and cant must be compatible with single-ply roofing membrane.

D. Tapered Roof Insulation: Provide tapered roof insulation as required to fulfill slope requirements. Tapered roof insulation must be compatible with single-ply roofing membrane.

E. Mechanical Fasteners: Stainless steel deck fasteners, size and configuration of fasteners shall be approved by roof insulation manufacturer and single-ply roofing membrane manufacturer.

2.3 PVC SHEET ROOFING

A. Membrane Material:
   1. Polyvinyl chloride (PVC) sheet material.
   2. Thickness: 60-mil minimum, with Elvaloy KEE and fleece back, reinforced for mechanically attached membranes.
   3. Exposed membrane shall be resistant to ozone, ultraviolet radiation, and water permeable.
   4. Top sheet shall be white color membrane.

B. Sheet Size: Maximum width and length of sheet possible as determined by project conditions.

C. Slip Sheet: As determined by membrane manufacturer if installation is necessary for conditions encountered.

D. Flashing: PVC coated galvanized steel or membrane manufacturer's approved material for conditions encountered.

2.4 RELATED MATERIALS

A. Asphalt Bitumen: ASTM D 312, Type III and IV.

B. Adhesives:
   1. As recommended by roofing sheet manufacturer for bonding to substrates and for waterproof sealing of seams.
   2. Do not use bonding adhesive for splice cement.

C. Fasteners: Provide either stainless steel fasteners or Fluorocarbon coating over electroplated zinc-chromate conversion-coated fasteners; size and configuration as approved by membrane manufacturer for conditions encountered and to comply with warranty requirements.

D. Accessories: Provide primers, batten strips, adhesives, sealants, mastics, prefabricated pipe flashing, roof drain flashing, liquid sealers, sponge tubing expansion joint filler, expansion joint flashing, and appropriate cleaning agents and solvents as recommended by membrane manufacturer for conditions encountered.

E. Expansion Joints: Provide manufacturer's approved expansion joints for conditions encountered. Provide expansion joint sponge tubing installed on 2" high tapered cant strips where required by membrane system.

F. Walkway Protection: Provide additional layer of sheet roofing membrane around all roof-top mounted mechanical equipment and where shown on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces scheduled to receive roofing to assure that they are smooth, dry, and free from oils, grease, and conditions that will adversely affect execution, permanence, or quality of work.

3.2 PREPARATION OF SURFACES

A. Comply with manufacturer's instructions for substrate preparation.

B. Sweep surfaces upon which sheet is applied, removing loose and foreign materials.

C. Fill voids in substrate as recommended by system manufacturer.

D. Coat metal surfaces with primer or adhesive as recommended by manufacturer.

3.3 INSULATION INSTALLATION

A. Install insulation in minimum of two layers for polyisocyanurate insulation over all areas to receive roof insulation.
   1. First layer of insulation shall be a minimum of 1-1/2" thick.
   2. Install layers (polyisocyanurate insulation) over all areas to receive roof insulation. Apply each layer over the previous layer in broken joint pattern so that each layer breaks joints both ways with the preceding layer.
   3. Apply insulation with long joints continuous and short joints staggered.
   4. Bring insulation panels into moderate contact with each other and cope to fit neatly around projections. Joints parallel to ribs on steel deck installation shall be located over solid bearing.

B. Mechanically fasten all layers of insulation to the deck throughout. Spacing and number of fasteners shall meet current building code requirements and per ASCE 7 calculations.
   1. Tapered roof insulation system and crickets shall be installed per manufacturer's instructions as required to meet current building code requirements and per ASCE 7 calculations.
   2. Do not install more insulation at one time than the amount which can be covered with roofing the same day.
   3. At the end of each day's work and after any other work stoppage, apply temporary water cutoffs in accordance with single-ply membrane manufacturer's approval.

3.4 COVER BOARD INSTALLATION

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Fasten cover boards to meet current building code requirements and per ASCE 7 calculations.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
   3. Use appropriate corrosion-resistant fasteners

3.5 BITUMEN HANDLING

A. Do not mix different types of asphalt.

B. Use only ASTM D 312, Type III or Type IV Steep Asphalt. Type III asphalt may be used on slopes up to 1/2' per foot. Type IV asphalt must be used on all slopes greate4 than 1/2" per foot.

C. Application with hot asphalt requires continuous, uniform interply mopping rates of 25 Ibs. +/- 20% per 100 square feet of roof area.

D. Application temperature of the asphalt must be at the Equiviscous Temperature (EVT) with a tolerance of +/- 25°F, at which a viscosity of 125 centipoise is attained. When using mechanical asphalt applicators, the target viscosity should be 75 centipoise.

E. For all SBS modified asphalt flashings; the minimum application temperature of the asphalt must be at the EVT or 425 deg F, whichever is greater, with a rolling bank (puddle) of mopping asphalt across the full width of the roll.

F. Do not heat the asphalt to or above its flash point or hold the asphalt at temperatures above the finished blowing temperature for more than 4 hours.

G. Do not keep heated tankers above 325°F overnight.

3.6 MEMBRANE INSTALLATION

A. General: Manufacturer's technical representative is required to be present as necessary to ensure proper installation. Install materials in accordance with manufacturer's printed instructions.

B. Slip Sheet:
   1. Install slip sheet loosely laid above cover board, lapping joints 4" minimum.
   2. Turn slip sheet up parapets and curbs.

3. Spot adhere slip sheet on vertical surfaces not more than 8" above roof line.

C. Membrane Installation: Fully adhered.
1. Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be fully adhered immediately after it is rolled out, followed by welding to adjacent sheets.
2. Overlap roof membrane a minimum of 3" (15 cm) for side laps and 3" (15 cm) for end laps.
3. Install membrane so that the side laps run across the roofslope lapped towards drainage points.
4. All exposed sheet comers shall be rounded a minimum of 1".
5. Use full width rolls in the field and perimeter region of roof.
6. Fully adhere membrane sheets to the substrate with hot roofing asphalt at a rate of25 Ibs per 100 square feet.
7. Prevent seam contamination by keeping the asphalt application a few inches back from the seam area.
8. Adhere approximately one half of the membrane sheet at a time. One half of the sheet's length shall be folded back in tum to allow for asphalt application. Lay membrane into asphalt immediately after application.
9. Roll membrane with a weighted roller to ensure complete bonding between asphalt and membrane.
10. Membrane laps shall be hot-air-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of bums and scorch marks.
11. Weld shall be a minimum of 1-112" in width for automatic machine welding and a minimum 2" in width for hand welding.
12. Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than five (5) degrees (1" in 12"). Roofing membrane shall be secured to the structural deck with appropriate Drill-Tec™ screws and plates spaced every 12" o.c. The screws and plates must be installed no less than 1,6" from the membrane edge. Alternatively, the roofing membrane may be turned up the vertical plane a minimum of3" and secured with screws and termination bar. Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 1-112" to 2" ofthe plane of the roof membrane, with a minimum of 1" of membrane extending above the termination bar.
13. Supplemental membrane attachment to the structural deck is required at all penetrations unless the insulation substrate is fully adhered to the deck. Roofing membrane shall be secured to the deck with appropriate Drill-Tec™ screws and plates.
14. Fasteners must be installed to achieve the proper embedment depth. Install fasteners without lean or tilt.
15. Install fasteners so that the plate or tennination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate or tennination bar to move (underdriving), but will not cause wrinkling of the membrane (overdriving).

D. Equipment Pads:
1. Adhere membrane over equipment supports or pads prior to installation of mechanical equipment.
2. Place loose piece of membrane under each equipment isolator pad prior to attachment of equipment to pad.
3. Provide sealant over exposed fasteners.

E. Expansion Joints: Install expansion joints in accordance with manufacturer's recommendations.

F. Flashing:
1. Install flashings as indicated and recommended by manufacturer.
2. Use longest pieces practicable.
3. Extend splice 3" beyond fasteners which attach membrane to batten strip.
4. Apply bonding adhesive to flashing and surface to which flashing is to be applied to obtain 100% bond.
5. After bonding adhesive has dried to point where it does not string, roll flashing into adhesive.
6. Take measures to assure flashing is not ridging where there is change of direction.
7. Full flashing at parapet walls shall extend up under metal parapet coping to exterior face of wall.
8. Fasten top of flashing under metal counterflashing at manufacturer's recommended spacing.
9. Flash penetrations passing through membrane.
10. Use factory prefabricated pipe seals where installation is possible.
11. When prefabricated pipe seals cannot be used, field fabricate pipe seals.
12. Provide prefabricated pipe seals for pitch pockets.
13. Install fillers around penetrations and fill pocket with non-shrink grout and manufacturer's approved sealer.

3.7 TERMINATIONS

A. Provide water cutoffs at end of each day's work as discussed at pre-roofing conference.

B. Pull membrane loose from water cutoff and remove contaminated material before resuming work.

3.8 WALKWAY PROTECTION

A. Install additional layer of roofing membrane of size and configuration as shown.

B. Invert walkway membrane (if possible), producing a contrasting color from roof membrane.

C. Clean roof membrane and bond walkway membrane to obtain 100% coverage on both mating surfaces. Seal all seams.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sheet metal flashing and trim.

B. Related Sections:
1. Section 07 53 00 - Single-ply Membrane Roofing**.**
2. Section 07 92 00 - Joint Sealants.
3. Section 09 91 00 - Painting.

1.2 SUBMITTALS

A. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit for approval samples of parapet coping cover expansion joint and soldered joint.

1.3 QUALITY ASSURANCE

A. Standard: Comply with the requirements of the Architectural Sheet Metal Manual published by SMACNA.

B. Installer Qualifications: Company specializing in sheet metal flashing work with three years minimum experience in similar sized installations

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect products under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Stack pre-formed material to prevent twisting, bending, and abrasions, and to provide ventilation.

C. Prevent contact with materials which may cause discoloration or staining.

1.5 WARRANTY

A. Furnish to the Owner a written warranty providing the following without cost to the Owner.
1. Sheet metal roof flashings shall be maintained in normal repair and free of leaks for a period of 2 years from the date of acceptance of the roof.
2. At end of 2-year period, Owner and Contractor shall make final inspection of flashing work. Holes, breaks and other defects shall be promptly repaired at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Metal: ASTM A 653
1. Roof top accessories, including but not limited to, expansion joint covers, flanges, and concealed counterflashings not visible from ground level shall be Coating Designation G90 Paint Grip, zinc coated (galvanized) copper-bearing steel sheet, mill-phosphatized ready to receive field finishing in accordance with SECTION 09 91 00 - PAINTING
2. Areas which can be seen from the ground level, including but not limited to, fascia, scuppers, edging, and expansion joint terminations shall be prefinished fluorocarbon coating containing 70% Kynar 500. Colors shall be selected by Architect from Fluropon Standard colors as manufactured by Valspar.

B. Underlayment: ASTM D 226, 30 lb/100 s.f. weight felt containing no additives corrosive to sheet metals.

C. Solder: ASTM B 32, made from block tin and pig lead (50/50) with no antimony.

D. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

E. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

F. Sealant: Two component polyurethane, non-sagging, sealant as specified in SECTION 07 92 00 - JOINT SEALANTS.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

H. Miscellaneous items such as nails and mastic shall be furnished as required by the conditions of use and must be of the best grade available.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, free from distortion and defects, to profiles indicated in accordance with SMACNA Architectural Sheet Metal Manual.

B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.

C. Form pieces in longest practical lengths.

D. Hem exposed flashings on underside ½"; miter and seam corners.

E. Solder and seal metal joints except those indicated or required to be expansive type joints. After soldering, remove flux. Wipe and wash solder joints clean.

F. Fabricate corners from one place with minimum 18" long legs; solder for rigidity; seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward ¼" and hemmed to form drip.

H. Fabricate flashings to allow toe to extend minimum 2" over wall surfaces.

I. Fabricate as much as possible in shop with machinery to eliminate as much hand tooling on the job as possible. Shop fabricate to allow for adjustments in the field for proper anchoring and joining.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

C. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

D. Install one layer of underlayment prior to installing copings.

3.3 INSTALLATION

A. General: Fabricate, assemble, and install sheet metal work in conformance with referenced standard.
1. Make adequate provision for metal expansion and contraction without buckling or splitting. Use cleats and watertight slip and expansion joints.
2. Nails and screws shall be of the same metal as the member on which used. Nails through exposed wash surfaces will not be permitted.
3. When soldering, use flux and wash off surplus flux after soldering has been completed.
4. Set sheet metal with horizontal lines straight and level. Surfaces shall be flat without wrinkles and waves. Profiles shall align at joints with no offsets.
5. Conform to drawing details included in manuals published by SMACNA and NRCA.
6. Edge Securement for Low-Slope Roofs: Design in accordance with ANSI/SPRI ES-1 for basic wind speed zone with 3-second gusts.
7. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
8. Seal metal joints watertight.
9. Provide electrolytic separation between dissimilar metals with protective back paint.

B. Reglet: Install surface mounted reglets on walls.
1. Clean surface of oil, grease and loose particles.
2. Place sealant bead on back in groove and on lap.
3. Secure reglet in precise alignment to wall with power driven pins spaced 12" o.c.
4. Lap joints 3" and bed in sealant. Miter and seal corners.

C. Reglet Counterflashing: Counterflashing for reglet shall be formed of 24 gage metal to fit the reglet in conformance with the manufacturer's instructions.
1. Lap counterflashing down over flashing strip approximately 4" and form lower edge with a spring bend against the base flashing.
2. After roofing and flashing strip have been installed, snap counter-flashing up into reglet so that it is held securely in place without screws or clips.
3. Lap end joints 3" and bed in sealant. Miter and seal corners.

D. Scupper: Form and install scuppers of 24 ga. metal through the parapets.
1. Form scuppers with outside edges hemmed and flanged.
2. To inside of scupper lock and solder an apron extending out over the roof deck and up under the counterflashing at the top.
3. Set scupper in roof cement. Roofing cement must be approved by single-ply roofing membrane manufacturer.

E. Vent Stack Roof-Penetration Flashing: Flashing shall have a weight range of 2 – 4 lbs/sq. ft. Coordinate installation of roof-penetration lead flashing flange with installation of roofing and other items penetrating roof. Base flashing shall be flanged 4 in. onto the roof. The flange is fastened through the roofing felts and is then stripped in by the roofer. Turn the top of the flashing down inside the vent pipe. Seal with sealant per Section 07 92 00 – Joint Sealants, and clamp flashing to pipes that penetrate roof.

F. Roof Expansion Joint Cover: Form and install the continuous covers and flashing required to make the roof expansion joints watertight.
1. Install covers over the ice and watershield on wood curbs and nail flanges to the wood curbs in accordance with roofing membrane manufacturer's instructions.
2. At wall intersections, nail upper vertical flange to wall just below receiver reglet and seal top edge and nail heads with roof cement.
3. Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation In-fill: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on both faces, 1-1/2" thick.
4. Vapor Retarder: Vapor retarder membrane shall be 45 mils EPDM, minimum 24" roll width. Drape vapor retarder down into expansion joint the full depth of the joint, and secure to face of wall and to top of expansion joint curb. Install in continuous length, without joints. Install in-fill insulation per detail.
5. Ice and Watershield Underlayment: Provide Ice & Watershield self-adhered roofing underlayment as manufactured by Grace Construction Products. Extend membrane over expansion joint opening and secure to face of wall and front face of expansion joint curb nailer with screws (do not secure to top of curb).
6. Splice joints and intersections of covers in accordance with the manufacturer's instructions.

G. Splash Pans: Provide 24 gage galvanized metal splash pans where downspouts discharge onto roofs. Install pans in mastic (mastic must be approved by membrane manufacturer) to set flat on the roof and secure to downspouts by riveting and soldering.

H. Miscellaneous flashings and other items of sheet metal roof work shall be provided as required for a weathertight job.

END OF SECTION

SECTION 07 65 00

FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concealed through-wall flashing system.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 05 40 00 - Cold-formed Metal Framing.
3. Section 07 27 26 - Fluid-Applied Membrane Air Barriers.
4. Section 09 21 16 - Gypsum Board Assemblies; sheathing.

1.2 GENERAL

A. Contractor shall review American Concrete Institute 530.1 mandatory specification checklist for additional requirements necessary for specific project.

1.3 QUALITY ASSURANCE

A. At a scheduled pre-construction meeting with all trades, contractor shall review flashing for the project and how the flashing shall be sequenced with the following: below grade waterproofing, air and vapor system, window installation, sealant installation, relief angles and roofing.

1.4 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Contractor shall provide from the manufacturer a review of the flashing design for the project and location of preformed shapes on reduced floor plan.

C. Product Certificates: From flexible flashing manufacturer, certifying compatibility (including adequate adhesion) of flexible flashing and accessory materials with Project materials that connect to or that come in contact with flexible flashing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers and rolls with all labels intact and legible including labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

B. Manufacturer's packaging and/or roll plastic is not acceptable for exterior storage. Tarpaulin with grommets shall be minimum acceptable for exterior coverings. All materials stored as above shall be a minimum of four inches (4") off the substrate, and the tarpaulin tied off with rope.

C. Deliver materials in sufficient quantity to allow continuity of work.

D. Handle and store material in such a manner as to avoid damage.

E. Protect materials against damage by construction traffic.

F. Storage: All materials should be stored under cover to avoid site damage. During cool weather construction, store materials inside at 50º F or higher.

G. The proper storage of materials is the sole responsibility of the contractor and damaged materials shall be discarded, removed from the project site, and replaced prior to application.

1.6 SITE CONDITIONS

A. Job Condition Requirements: Coordinate the work of the contractor with the work to be performed by the Owner's personnel, to ensure proper sequencing of the entire work. The contractor shall follow local, state, and federal regulations, safety standards, and codes. When a conflict exists, use the stricter document.

B. Protection of Work and Property:
   1. Work: The contractor shall maintain adequate protection of all his work from damage and shall protect the Owner's and adjacent property from injury or loss arising from this contract. He shall provide and maintain at all times any OSHA required danger signs, guards, and/or obstructions necessary to protect the public and his workmen from any dangers inherent with or created by the work in progress. All federal, state, and city rules and requirements pertaining to safety and all EPA standards, OSHA standards, NESHAP regulations shall be fulfilled by the contractor as part of his proposal.
   2. Property: Protect existing planting and landscaping as necessary or required to provide and maintain clearance and access to the work of this contract. Examples of two categories or degrees of protection are generally as follows:
      a. removal, protection, preservation, or replacement and replanting of plant materials;
      b. protection of plant materials in place, and replacement of any damage resulting from the contractor's operations.

C. Damage to Work of Others: The contractor shall repair, refinish, and make good any damage to the building or landscaping resulting from any of his operation. This shall include, but is not limited to, any damage to plaster, tile work, wall covering, paint, ceilings, floors, or any other finished work. Damage done to the building, equipment, or grounds shall be repaired at the successful contractor's expense holding the Owner harmless from any other claims for property damage and/or personal injury.

D. Measurements: It will be the contractor's responsibility to obtain and/or verify any necessary dimensions by visiting the job site, and the contractor shall be responsible for the correctness of same. Any drawings supplied are for reference only.

E. Cleaning and Disposal of Materials:
   1. Contractor shall keep the job clean and free from all loose materials and foreign matter. Contractor shall take necessary precautions to keep outside walls clean.
   2. All waste materials, rubbish, etc., shall be removed from the Owner's premises as accumulated. Rubbish shall be carefully handled to reduce the spread of dust. At completion, all work areas shall be left clean and all contractor's equipment and materials removed from the site.
   3. Debris shall be deposited at an approved disposal site.

PART 2 - PRODUCTS

2.1 BUILT-IN FLASHING MEMBRANE (ELVALOY® SHEET)

A. The built-in flashing membrane shall be 40 mil flexible sheet material, consisting of a blend of elastomeric and thermal plastic polymers, incorporating DuPont™ Elvaloy® The membrane shall be reinforced with synthetic fibers, calendered into sheet form, rolled and cut to width.

B. Cloaks shall be pre-formed, three dimensional flexible units used for detail corners, level changes, stop ends, and special applications.

Physical Properties		
Elongation	175%	ASTM D412
Tensile Strength	650 psi	ASTM D412
Tear Strength	280 psi	ASTM D624
Low Temperature Flexibility	-25º F Pass	ASTM D146
Water Absorption	Less than 0.1%	ASTM D471

2.2 RELATED MATERIALS FOR BUILT-IN FLASHING MEMBRANE

A. Joint Support Boards: Aid the mason in lap formation by providing a flat work surface and in-cavity support for membrane joints. The boards shall be used under all membrane to membrane laps.

B. Double-Sided Tape: Shall be a two-sided, self-adhering tape used to seal joints in membrane and joints between membrane and cloaks. Adhesive may be used as an alternative.

C. Drip Plate: Type 304 stainless steel, 26 ga., 3-1/2" drip plate with prefabricated inside/outside corners and end dams. Basis of Design shall be Hohmann & Barnard #DP.

D. Mastic: Shall be used at all laps and joints.

2.3 SURFACE-ADHERED FLASHING MEMBRANE (ELVALOY® SHEET)

A. Surface-adhered membrane shall be a composite 40 mil membrane consisting of 25 mils of elastomeric/thermal plastic membrane incorporating DuPont™ Elvaloy® and 15 mils of SBS asphaltic adhesive. The membrane shall be reinforced with synthetic fibers, calendered into sheet form, rolled and cut to standard widths.

B. Standard Sheet Dimensions:

Thickness	40 mil
Roll length	75 ft
Roll widths	12, 18, 24, 36 in

C. Cloaks shall be pre-formed, three dimensional flexible units used for detail corners, level changes, stop ends, and special applications.

Physical Properties		
Elongation	225%	ASTM D412
Tensile Strength	875 psi	ASTM D412
Tear Strength	270 psi	ASTM D624
Low Temperature Flexibility	-25º F Pass	ASTM D146
Water Absorption	Less than 0.1%	ASTM D471

2.4 RELATED MATERIALS FOR SURFACE ADHERED FLASHING MEMBRANE

A. Double-Sided Tape: Shall be a two-sided, self-adhering tape used to seal the top of cloaks against the back-up wythe. Adhesive may be used as an alternative.

B. Mastic: Shall be used at all laps and joints, and top terminations.

C. Termination Bars for Flexible Flashing: Stainless steel bars 1/8" x 1".

D. Drip Plate: Type 304 stainless steel, 26 ga., 3-1/2" **[2-1/2" at King Brick]** drip plate with prefabricated inside/outside corners and end dams. Basis of Design shall be Hohmann & Barnard #DP.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other specific conditions.

3.2 GENERAL

A. Laying Masonry Walls: Use an inverted lintel CMU or fully grouted hollow CMU as a base for flashing at sills, floor joints, and other similar conditions.

B. Preparation: All sharp protrusions and mortar droppings must be removed from the substrate, and the surface must be clean and dry.

C. Where brick work occurs about the roof elevation, provide solid protection of the existing roof system until work is complete.

3.3 INSTALLATION OF BUILT-IN FLASHING MEMBRANE (ELVALOY® SHEET)

A. Set drip plate in full bed of sealant. Lap joints 3" with bead of sealant between and tooled sealant on top edge of overlap. Flashing membrane and cloaks shall be installed in a bed of fresh mortar.

B. Weep holes shall be provided immediately above all flashing at 24-inch centers. A minimum of two weeps shall be installed above any wall opening.

C. All joints in the flashing membrane shall be lapped a minimum of four inches (4") using double sided tape or flashing adhesive and a joint support board.

D. Flashing membrane shall be installed six inches (6") above top of cavity drainage material.

E. Cloaks and end dams shall be installed at all window and door heads and sills.

F. Vertical flashing at wall openings shall extend into the wall opening one inch (1"). The door/window frame shall be installed with the flashing extending into the frame.

G. Cleaning: Flashing membrane shall not be damaged by cavity cleaning after installation. Precautions to be taken during subsequent work are:
   1. Use of cavity battens to prevent mortar droppings;
   2. Removal of droppings before they harden;
   3. Never use implements such as steel rods for cleaning the cavity; and
   4. Inspection of cavity flashing for damage as the work proceeds.

3.4 INSTALLATION OF SURFACE-ADHERED FLASHING MEMBRANE (ELVALOY® SHEET)

A. Priming: If the surface-adhered flashing membrane will not adhere to the substrate or the substrate is dusty or dirty, the area shall be primed. Flashing primer shall be applied with a brush, roller or sprayed. Coverage is approximately 400 square feet per U.S. gallon (3.78L). Drying time may vary depending on temperature, humidity, and air movement; drying time should be approximately 45 minutes.

B. Flashing System Installation: Starting at a corner, mount cloak to substrate using double-sided tape or flashing adhesive. Cut surface adhered membrane into workable sections (8'-10'). Remove the release sheet and adhere the membrane to the inner leaf of construction lapping the membrane onto the cloak four inches (4"). Use firm hand pressure and a steel roller to totally adhere membrane in place. Extend membrane completely through the outer leaf and leave it exposed ¼" minimum. The surface-adhered membrane is not UV sensitive. Apply a bead of flashing mastic to all top termination edges.

C. Termination Bar: The surface-adhered membrane shall be installed using a termination bar for additional attachment to the inner leaf.

D. Weep holes shall be provided immediately above all flashing at 24-inch centers. A minimum of two baffle weeps shall be installed above any wall opening.

E. Flashing membrane shall be installed six inches (6") above top of cavity drainage material.

F. Stop end cloaks shall be installed at all windows, door heads, sills, and through-wall starts, stops, steps, etc.

G. Enveloped vertical flashing at wall openings shall extend into the wall opening one inch (1"). The door/window frame shall be installed with the flashing extending into the frame. Enveloped vertical flashing shall be installed at all abutments of dissimilar exterior wall treatments: inside and outside nineties (90°), etc.

H. Cleaning: Flashing membrane shall not be damaged by cavity cleaning after installation. Precautions to be taken during subsequent work are:
   1. Use of cavity battens to prevent mortar droppings;
   2. Removal of droppings before they harden;
   3. Never use implements such as steel rods for cleaning the cavity; and
   4. Inspection of cavity flashing for damage as the work proceeds.

3.5 FLASHING SCHEDULE

A. Flashing as follows with membrane:
   1. Over steel lintels, plates and angles in exterior masonry walls.
   2. Within masonry parapets and walls as through flashing to detail.

3. At the bottom of cavity walls with weep holes.
4. Under window sills to detail.
5. Elsewhere in walls where indicated.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 72 13

MANUFACTURED ROOF CURBS AND PORTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefabricated roof curbs and penetration portals.

B. Related Sections:
1. Section 05 31 00 - Steel Decking.
2. Section 05 50 00 - Metal Fabrications.
3. Section 06 10 00 - Rough Carpentry: Field-constructed curbs and cants.
4. Section 07 53 00 - Single-ply Membrane Roofing**.**
5. Section 07 62 00 - Sheet Metal Flashing and Trim: Flashings and counter-flashings.
6. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit following items under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Indicating technical and performance data of products.

C. Shop Drawings: Indicating details of special connections and transitions, typical section details, and layout showing intended locations for use of products.

D. Manufacturer's Instructions: Printed instructions for recommended installation methods and sequences for all products.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in the manufacturing of prefabricated roof expansion joints for a minimum of 5 years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Prevent contact with materials which may cause discoloration or staining.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers
1. Roof Curbs: RPS Expansion Curbs (EC-2B, with 2" extended flange), Roof Curbs (RC-2B) and Equipment Rail (ER-2B) by Roof Products and Systems Corp., Bensenville, Illinois.
2. Penetration Portals: M-curb as manufactured by M-weld, or equal by Chem Link Inc.
3. Pipe Mounting Pedestal: For pipes 2" to 3-3/4" o.d., provide Model 3-R-2 Pedestals as manufactured by Miro Industries, Inc. Murray, Utah.

B. Substitutions: Submit in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 SIZES AND CONFIGURATIONS

A. Provide in sizes and configurations as required to accommodate joint widths, penetrations, and equipment being supported.

B. Provide configurations and special transitions as shown or required to utilize factory formed pieces wherever possible.

C. Provide custom factory-formed pieces conforming to roof slope to allow for a level equipment installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Verify that curbs are level and flashing reglets have been installed at proper locations.

C. Verify that insulation has been packed into joint prior to beginning work.

3.2 INSTALLATION

A. Interface with other systems. On roof mounted expansion joints, set flanges in adhesive and make watertight over cant strip.

B. Install using skilled workmen in accordance with manufacturer's printed instructions and recommendations.

C. Anchor units securely with fasteners and at spacing as recommended by manufacturer.

D. Where metal surfaces are to be in contact with corrosive substrates, apply bituminous coating on concealed metal surfaces.

E. Splice sections of curbs together with procedures as recommended by manufacturer for a solid, watertight installation.

F. Penetrations of piping through equipment curbs shall not be permitted.

G. Utilize factory fabricated intersections and transitions wherever possible. Field fabricate where pre-manufactured sections are not available.

3.3 PROTECTION

A. Protect completed installation under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

END OF SECTION

SECTION 07 81 16

CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Direct-to-steel fireproofing sprayed on shop primed steel members, galvanized floor deck, and galvanized roof deck, as scheduled. Material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction**.**

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 05 12 00 - Structural Steel Framing.
3. Section 05 21 00 - Steel Joists Framing.
4. Section 05 31 00 - Steel Decking.
5. Section 09 21 16 - Gypsum Board Assemblies: gypsum wallboard fireproofing.

1.2 SUBMITTALS

A. Fireproofing Design: Submit copies of each UL Design selected for each required fire resistance rating, including an applicator's certification that each UL Design selected will provide the scheduled fire resistance rating in accordance with the referenced building code.

B. Certificates:
1. Provide manufacturer's certification or independent test reports confirming that installed materials meet or exceed performance criteria specified.
2. Provide reports from reputable independent testing agencies, of product proposed for use, which indicate conformance to ASTM E 84 and E 119.
3. Provide manufacturer’s certification that UL Designs selected for the project are not load restricted.

C. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit manufacturer's literature of products furnished, including application instructions.

D. Thickness Schedule: Provide schedule indicating material to be used, building elements to be protected with spray-applied fireproofing, hourly rating, and material thickness provided and appropriate references.

1.3 QUALITY ASSURANCE

A. Applicator: Work shall be performed by a firm acceptable to the cementitious fireproofing material manufacturer.

B. Requirements of Regulatory Agencies:
1. Underwriters' Laboratories, Inc.: Products, execution, and thickness shall conform to approved UL Designs as published in UL Fire Resistance Directory.
2. Testing: Sprayed fireproofing designs shall be as tested and certified to attain specified fire resistance ratings in accordance with ASTM E 119.
3. Local Building Code: Fireproofing material shall have approval of governing code authorities for this building's materials and designs.

C. Pre-installation Conference: Conduct conference at project site. Contractor, fireproofing subcontractor, and independent testing laboratory shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, inspection procedures, and other issues.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with legible and intact manufacturers' labels identifying products. Include on labels names of products, manufacturers, and date of manufacture. Also include UL labels for fire-resistance ratings applicable to project.

B. Store materials inside, under cover, above ground and in a manner to keep them dry until ready to use. Remove from project site and discard materials that have been exposed to moisture or have otherwise deteriorated.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40°F. and falling. A minimum air and substrate temperature of 40°F. must be maintained during and for 24-hours after application of the spray-applied fireproofing.

B. Protection:
1. Provide ventilation in area to receive fireproofing. Provide ventilation in poorly ventilated areas to achieve a total air exchange rate of 4 times per hour until the material is substantially dry.
2. Provide temporary enclosures to prevent spray from contaminating air or adjacent property.
3. Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting-off of fireproofing.

1.6 SEQUENCING

A. Coordinate installation with other work to avoid cutting and patching of installed fireproofing.
1. Clips, hangers, clamps, sleeves, stops, and other attachments to the substrate shall be installed prior to application of fireproofing.
2. Concrete work on steel floor decking shall be completed prior to application of fireproofing to the underside of the deck.
3. Roofing system, including rigid insulation system on decking, shall be completed prior to application of fireproofing to the underside of the deck.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Sprayed-on Cementitious Fireproofing; product/manufacturer:
Monokote MK-6; Construction Products Div., W.R. Grace & Co.
Cafco BlazeShield II; Isolatek International
Pyrolite No. 15; Carboline Company - Fireproofing Products Division.

B. Bonding Agent; Product/Manufacturer:
Fire Bond; Grace Construction Products Div., or approved equivalent.

2.2 SPRAYED-ON FIREPROOFING MATERIALS

A. General: Provide manufacturer's standard applications of standard products complying with requirements indicated below for material composition and physical properties representative of installed products.

B. Material Composition: Cementitious Fireproofing consisting of factory-mixed, dry formulation mixed with water at project site to form a slurry or mortar for pumping and for dispersal by compressed air introduced at spray nozzle. Cement-aggregate formulation, chloride free, composed of Portland cement, additives, and inorganic aggregates. NOTE: Mineral Fiber fireproofing will not be permitted.

C. Physical Properties of Fireproofing: Minimum values, unless otherwise indicated or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed below:
1. Bond Strength: 339 lbf. per sq. ft. per ASTM E 736.
2. Compressive Strength: 1,440 lbf. per sq. ft. per ASTM E 761.
3. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
4. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.
5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like per ASTM E 760.
6. Air Erosion: Maximum weight loss of 0.0025 grams per sq. ft. in 24 hours per ASTM E 859.
7. Dry Density: 15 pcf for average and individual densities as required for fire-resistance rating indicated, per ASTM E 605.
8. Surface Burning Characteristics: ASTM E 84.
a. Flame Spread: 0
b. Smoke Developed: 0

D. Water: Clean, potable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surfaces to receive fireproofing shall be free of mill scale, dirt, oil, grease, dust, loose rust, paint or other foreign substances which may impair proper adhesion of the fireproofing to the substrate.

B. Cleaning shall be accomplished just prior to the application of fireproofing.

C. Do not apply fireproofing to surfaces which cannot be corrected by normal cleaning methods. Correct condition before applying fireproofing..

D. Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

E. Complete placing of concrete on floor and roof decking prior to application of the fireproofing to the underside of steel deck and supporting beams and joists.

F. On roof decks without a concrete cover, complete all roofing applications and roof mounted equipment installation prior to application of the fireproofing to the underside of roof decking and supporting beams and joists. Prohibit all roof traffic upon commencement of the fireproofing and until the fireproofing material is dry.

G. Commencement of application of fireproofing shall be interpreted as acceptance by the applicator of the suitability of the surface to receive fireproofing material and acceptance of responsibility for failure of bond between fireproofing and steel

3.2 APPLICATION

A. Apply fireproofing in accordance with manufacturer's recommendations for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as particular conditions of installation and as required to comply with fire rating requirements and approved UL Designs indicated.

B. Spray apply with as many coats as necessary to obtain required thickness and uniform density.

C. Completely cover members designated to be fireproofed.

D. Install metal lath, as required, to comply with fire-resistance ratings and recommendations of fireproofing manufacturer for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fireproofing. Use anchorage devices of type recommended by fireproofing manufacturer. Attach lathing accessories where indicated or required.

E. Post appropriate cautionary "Slippery When Wet" signs in all areas in contact with wet fireproofing material. Erect appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixing areas and other areas exposed to wet fireproofing material.

3.3 FIELD QUALITY CONTROL

A. Field testing will be performed in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. Testing laboratory shall sample and verify the bond strength, thickness and density of the fireproofing in accordance with the provisions of ASTM E 605, ASTM E 736, and Chapter 17 of the applicable building code.

C. Re-testing required as a result of non-conforming work shall be paid for by the Contractor.

3.4 PATCHING

A. Inspect members for complete coverage, correct unacceptable work, and patch. Chip out areas which are defective or do not bond. Clean steel surface and reapply fireproofing.

B. Patch areas damaged or cut by other work. Patch area from which test samples are taken.

3.5 CLEANING, REPAIR, AND PROTECTION

A. Remove equipment. Immediately after completing spraying operations in each containable area of project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.

C. Protect fireproofing, according to advice of fireproofing manufacturer and Installer, from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of substantial completion.

D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any areas where fireproofing was removed or damaged.

E. Repair or replace work that has not been successfully protected.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Firestopping for all fire-rated construction complete, including, but not limited to:
   1. Firestopping in conjunction with gypsum board, masonry and plaster partitions.
   2. Firestopping shall include, but not be limited to the following applications:
      a. Sealing gaps between tops of partitions and roof/floor decks.
      b. Sealing gaps between structure and glass curtainwalls with fire safing insulation.
      c. Other locations where "firestopping", "firestop", or "safing" is indicated.
      d. Where required by codes.
      e. Control joints and expansion joints in masonry or gypsum board fire-rated partitions.
      f. Expansion joints in roof and floor assemblies.

B. Related Sections:
   1. Section 04 20 00 - Masonry Units.
   2. Section 07 21 00 - Building Insulation.
   3. Section 07 92 00 - Joint Sealants.
   4. Section 09 21 16 - Gypsum Board Assemblies.
   5. Divisions 23 and 26.

1.2 SUBMITTALS

A. Refer to SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit copies of manufacturer's literature. Include data substantiating that materials comply with specified tested system requirements.

C. Samples: Submit duplicate samples of each type of firestopping material and accessories.

D. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgement derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgement drawings must follow requirements set forth by the International Firestop Council.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not allow firestopping materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection.

1.4 PROJECT CONDITIONS

A. Do not install firestopping materials until building is completely enclosed and weathertight.

B. Coordinate installation with the work of other trades. Reference SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

PART 2 - PRODUCTS

2.1 PRODUCT/MATERIAL PERFORMANCE REQUIREMENTS

A. Except as otherwise indicated, firestop materials shall be classified in the Underwriters Laboratories (UL) Building Materials Directory, "Section XHEZ-Through-Penetration Firestop Systems", and/or "Section XHHW-Fill Void or Cavity Materials", and “Section XHBN - Joint Systems” for specific project conditions:
   1. Time rating ("F", Fire and "T", Temperature) (T-rating is only required for construction joint systems).
   2. Floor or wall assembly and material.
   3. Penetrating materials/items diameters, or void space.
   4. Through opening size.

5. Annular space between penetration opening and penetrating item.

B. Firestopping materials shall provide a fire-rating commensurate with the adjacent construction rating.

C. Firestop materials shall comply with ASTM E 84: Surface Burning Characteristics.

D. Firestop materials shall have been tested in accordance with ASTM E 814, UL 1479 or UL 2079.

E. Firestop materials shall be free of asbestos.

F. Firestop materials shall be paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

G. Obtain firestop products from a single manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine substrate and conditions under which firestopping work is to be performed, and notify Contractor in writing of any unsatisfactory conditions.

3.2 INSTALLATION

A. Install firestopping materials including foaming, packing and accessory materials to fill openings around penetrations in floors and walls, to seal gaps between decks and partitions, gaps between structure and curtainwall, etc., to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Use silicone based materials for all wet or damp conditions.

B. Install firestop materials and systems in accordance with manufacturer's printed instructions and applicable UL Building Materials Directory assemblies.

C. Cut and friction fit fire safing type insulation firestopping to completely fill all gaps and voids. Provide stick-clips, sheet metal closures, and any other accessories to support insulation.

D. Where floor openings are 4" or more in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Remove damming materials after curing if made of other than fire resistant materials.

F. Protect materials from damage on surfaces subject to traffic.

3.3 FIELD TESTING

A. Firestop materials and installation may be tested by an independent testing laboratory. Refer to SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

3.4 CLEAN UP

A. Clean up all debris caused by the work of this Section, keeping the premises clean and neat at all times.

B. Clean adjacent surfaces soiled by the work of this section.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sealing and caulking of joints.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.
2. Section 04 20 00 - Masonry Units.
3. Section 07 62 00 - Sheet Metal Flashing and Trim.
4. Section 07 84 00 - Firestopping.
5. Section 08 80 00 - Glazing.
6. Section 09 21 16 - Gypsum Board Assemblies.

1.2 SUBMITTALS

A. Submit under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color availability and application instructions.

C. Submit two samples ¼" diameter x 4" in size illustrating color selections available.

D. Submit manufacturer's certificate under provisions of SECTION 01 45 00 - QUALITY CONTROL that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

B. Applicator: Company specializing in applying the work of this section with minimum 3 years documented experience and approved by sealant manufacturer.

C. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

1.4 FIELD SAMPLES

A. Provide samples under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Construct one field sample joint, 5 feet long, illustrating sealant type, color, and tooled surface.

C. Locate where directed.

D. Accepted sample may remain as part of the work.

1.5 PROJECT CONDITIONS

A. Environmental Requirements: No caulking shall be done at temperatures below 40°F.

1.6 WARRANTY

A. Furnish to the Owner a written warranty that the sealants shall remain watertight for a period of 2 years from the date of acceptance of the building. Joints which prove defective by leaking, cracking, melting or shrinking of the sealant shall be re-sealed without additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reference “SEALANT SCHEDULE” at end of this specification section for locations of Sealant Types.

B. Modified Polyurethane (Type 1 Sealant):
1. Two or three-part conforming to ASTM C 920, Type M, Grade NS, Class 25.
2. Color: Custom colors as selected by Architect.
3. Acceptable products:
MasterSeal NP2, BASF the Chemical Company
Dymeric 240FC, Tremco.

C. Pourable Urethane (Type 2 Sealant):
1. Multicomponent conforming to ASTM C 920, Type M, Grade P (pourable), Class 25, Use T (traffic).
2. Color: Custom color as selected by Architect.
3. Acceptable products:
Urexpan NR-200, Pecora Corp.
MasterSeal SL 2 Sealant; BASF the Chemical Company
THC 900 (Self leveling) or 901 (low sag), Tremco.

D. Silicone, General Purpose (Type 3 Sealant)
1. One-part rubber based silicone conforming to ASTM C 920, Type S, Grade NS, Class 100/50.
2. Color: As selected by Architect.
3. Acceptable products
790 Building Sealant, Dow Corning.
SCS2700 Silpruf LM, GE Silicones.
Spectrem 1, Tremco.

E. Polyurethane Hybrid, Paintable (Type 4 Sealant):
1. One-part, moisture-cure, polyurethane hybrid sealant for interior use, conforming to ASTM C 920, Type S, Grade NS, Class 35 and Fed. Spec TT-S-00230C, Class A, Type II.
2. Acceptable product:
Dymonic FC, Tremco

F. Silicone, Sanitary (Type 5 Sealant):
1. One-part conforming to ASTM C 920, Type S, Grade NS, Class 25, F.D.A. Regulation 21 CFR177.2600, and FDA Food Additive Regulation 121.2514.
2. Color: Clear.
3. Acceptable products:
786 Silicone Sealant - M, Dow Corning.
SCS1700 Sanitary, GE Silicones.

G. Acrylic Latex (Type 6 Sealant)
1. One-part, non-sag acrylic latex, siliconized, conforming to ASTM C 834, Type P, Grade NF.
2. Acceptable products:
AC-20+, Pecora Corp.
Sonolac; BASF the Chemical Company
Tremflex 834; Tremco.

H. Silicone Sealant (Type 7 Sealant):
1. Single-component, low-modulus, neutral-curing, non-sag silicone sealant complying with ASTM D 5893 for Type NS.
2. Color: Gray.
3. Product/manufacturer; one of the following:
RoadSaver Silicone; Crafco, Inc.
888; Dow Corning Corporation

I. Sealant (Type 8 Sealant): Reference SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D 1056 and D 1565 round. In vertical joints use closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width. In horizontal joints, use solid neoprene or butyl rubber, Shore A hardness of 70.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION

A. Joint surfaces shall be clean and dry. Remove loose mortar and other material completely with compressed air or by brushing.
   1. Joints to be caulked shall be at least ¼" wide unless specifically specified smaller. At any point where the width of the joint is appreciably less, cut or grind out the joint to that width to assure an adequate volume of sealant along the length of the joint, except at concrete paving joints, those shall remain ⅛" wide as indicated.
   2. Pack with backing material the voids and recesses around metal frames which are deeper than the depth required for caulking. Leave the proper depth for the sealant.
   3. In open joints and where detailed, install rod stock as backing material. Roll the material into the joints to avoid stretching. The natural thickness of the rod stock shall be approximately twice the thickness of the joint in which it is installed.
   4. In raked masonry joints, apply a bondbreaker strip of polyethylene or masking tape along the bottom of the joints.
   5. Where sealant is to be applied against smooth metal surfaces, wipe these surfaces clean with a suitable ketone solvent immediately prior to caulking.
   6. Particular attention shall be paid to the preparation of horizontal joints in wear surfaces to be filled with sealant. Adjust joint depth to comply with sealant manufacturer's recommendations by malleting down the joint filler or filling in with rod stock as may be required. Joints in concrete paving shall be primed in accordance with manufacturer’s recommendations.
   7. Perform preparation in accordance with ASTM C 1193 for solvent release sealants, C 1193 for latex base sealants, C 919 for acoustical applications, and C 1193 for elastomeric sealants.

3.3 APPLICATION

A. Priming: Prime porous joint surfaces, particularly masonry and concrete. Test the primer to make sure it causes no staining of the material on which it is applied.

B. Depth of sealant: Seal joints to a depth of approximately ½ the joint width, but never less than ¼" deep. Follow the sealant manufacturer's recommendations where possible.

C. Apply the sealant in accordance with the manufacturer's instructions.
   1. Force the sealant into joints with enough pressure to expel all air and provide a solid filling. Correct any flowing or sagging before final inspection is made.
   2. Where adjacent surfaces permit, use masking tape to obtain straight, even lines. Remove tape immediately after the joints have been sealed.
   3. Fill joints flush with adjacent surfaces except where a recessed joint is specifically detailed. Tool beads with a sled runner or similar tool to insure full contact with joint faces.
   4. For caulking horizontal joints in wear surfaces, use a gun with a narrow nozzle. Apply the flow type sealant with the nozzle riding along the bottom so that the sealant is forced up to completely fill the slot without cavities. Provide and use a portable vacuum cleaner to remove loose dirt from the joints just ahead of the caulking gun.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Tool joints concave. Sealant shall achieve a firm skin before surface coating is applied.

3.4 CLEANING/REPAIRING

A. Clean adjacent surfaces of soiling due to caulking operations. This applicator shall be responsible for and shall bear the cost of replacing any material damaged or discolored due to caulking operations.

B. Repair or replace defaced or disfigured finishes caused by work of this section.

3.5 SEALANT SCHEDULE

A. Locations specified below for sealants and caulking required under this section are general and shall not be considered as affecting the required use of sealing compounds specified under other sections of the specifications.

SEALANT TYPE		APPLICATION
1	a.	Vertical control and expansion joints in exterior and unpainted interior masonry surfaces.
	b.	Vertical joints at perimeter of window, door, and storefront elements where adjacent to stone, masonry, or concrete surfaces.
	c.	Reglets: The top groove along the surface-mounted flashing reglets.
	d.	Sealing joints in sheet metal fabrications.
	e.	Unless noted otherwise, any other exterior vertical joints.
2	a.	Interior horizontal control and expansion joints in flooring, stone, masonry and tile flooring and at junctures between these materials and other adjacent materials.
3	a.	Sealing of joints between plumbing fixtures and substrates and between plastic laminate splashes and adjacent tops and walls.
	b.	Threshold and windowsills set in full bed of sealant.
4	a.	General caulking as part of interior painting in joints subject to movement.
5	a.	Sealing joints between countertops and substrates in concession areas and elsewhere which may be in contact with food.
6	a.	General caulking as part of interior painting.
7	a.	Exterior horizontal control and expansion joints in concrete paving.
8	a.	Sealing of joints in exterior glass-mat gypsum sheathing

END OF SECTION

SECTION 07 95 00

EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Expansion joint assemblies for floor, wall and ceiling surfaces.
2. Preformed, foam joint seals.
3. Preformed, rubber joint seals.

B. Related Sections:
1. Section 03 11 00 - Concrete Forming and Accessories: Expansion and contraction joints in exterior concrete joints.
2. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof control joints.
3. Section 07 92 00 - Joint Sealants: Expansion and control joints.

1.2 SUBMITTALS

A. General: Submit under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Provide joint assembly profiles, dimensions, locations in the Work, affected adjacent construction, anchorage devices, available colors and finish, and locations of splices. Provide Manufacturer's Installation Instructions. Indicate rough-in sizes.

C. Certificates:
1. Expansion Joint Covers: Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.
2. Preformed Joint Seals: Tests performed by manufacturer and witnessed by a qualified testing agency for each preformed joint seal.
3. Warranties: Submit warranty information.

D. Samples:
1. Preformed Joint Seal:
a. Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.
b. Verification: For each type and color of preformed joint seal required, provide samples with joint seals in 2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint seals.
2. Expansion Joint Covers: Submit two 4" long samples, illustrating profile, dimension, color, and finish selected.

E. Templates: For cast-in or placed frames or anchors, and indicate tolerances for item placement.

F. Preformed Joint Seal Schedule: Include the following information:
1. Joint seal location and designation.
2. Joint width and movement capability.
3. Joint seal manufacturer and product name.
4. Joint seal color.

1.3 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.4 WARRANTY

A. Preformed Joint Seal:
   1. Special Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.
      a. Warranty Period: Two years from date of Substantial Completion.
   2. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
      a. Warranty Period: Five years from date of Substantial Completion.

1.5 EXTRA MATERIALS

A. Furnish under provisions of SECTION 01 78 40 - SPARE PARTS, OVERAGES, AND MAINTENANCE MATERIALS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Expansion Joint Covers: Factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.
   1. Basis-of-design Products for each architectural joint system is based on products by **Construction Specialties, Inc.** Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
      Architectural Art Mfg. Inc.
      Balco Metalines, Div. of Balco, Inc.
      MM Systems Corp.

B. Preformed, Foam Joint Seals (PJS-1): Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.
   1. Basis-of-Design Product: Provide **EMSEAL Joint Systems, Ltd.** Siesmic Colorseal, or subject to compliance with requirements, comparable products by one of the following:
      MM Systems Corporation.
      Nystrom, Inc.
   2. Design Criteria:
      a. Nominal Joint Width: As indicated on Drawings.
      b. Movement Capability: -50 percent/+50 percent.
   3. Joint Seal Color: As selected by Architect from full range of industry colors.
   4. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

C. Preformed, Rubber Joint Seals (PJS-2): The expansion joint shall be a continuous low stress multi-web elastoprene compression seal that remains in compression throughout its entire movement cycle. It shall be bonded in place with polyurethane adhesive creating a watertight seal. The rubber seal design shall have a multi-cellular design or ear lugs that to lock into an aluminum frame. The seal shall be supplied in the longest continuous length possible.
   1. Basis of Design Product: Provide **MM Systems Corp. Vertical Compression Seal (VCS Series)**, or subject to compliance with requirements, comparable products by one of the following:
      MM Systems Corporation
      Nystrom, Inc.
   2. Design Criteria:
      a. Nominal Joint Width: As indicated on Drawings.

b.	Tensile Strength	1000 psi (+75/-0)	D412
c.	Ultimate Elongation	445%	D412
d.	Hardness, Shore A	65 +/- 3 pts.	D2240
e.	Tear Strength	140 pli / 24.5 kN/m @ 23°C	D624
		58 pli / 10.2 kN/m @100°C	D624
f.	Compression set		
	168 hrs.	25% @ 23°C	D395
	168 hrs.	38% @ 100°C	D395
g.	Ozone Resistance	No Cracks	D1149

h. UV Resistance Very Good
i. Brittle Point -76°F D746

3. Joint Seal Color: As selected by Architect from full range of industry colors.
4. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

D. Substitutions: In accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B 221 6063-T5 alloy for extrusions; ASTM B 308 Alloy 6061-T6, for sheet and plate.

B. Threaded Fasteners: Stainless steel.

C. Primer: Manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials, or provide bituminous paint, impregnated paper or felt, or an alkali-resistant insulating coating.

D. Fire Rated Systems: Fire barrier caulk (SECTION 07 84 00 - FIRESTOPPING), fire blanket, and insulation.

E. Exterior Building Expansion Joint in Masonry Veneer: Provide Compression Seal Expansion Joint Model VCS-225 as manufactured by MM Systems

2.3 FABRICATION

A. All Metal Joint Covers: Aluminum frame construction, free of gaskets and fillers, designed to permit plus or minus 50% joint movement with full recovery, recess mounted.

B. Concealed aluminum surfaces in direct contact with masonry and concrete shall be shop coated with Manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials, or provide bituminous paint, impregnated paper or felt, or an alkali-resistant insulating coating..

C. Galvanize embedded ferrous metal anchors and fastening devices.

D. Shop assemble components and package with anchors and fittings.

E. Provide joint components in single length wherever practical. Minimize site splicing.

2.4 FINISHES

A. Floors: Mill finish.

B. Walls and Ceilings: Clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive the materials of this section.

B. Verify that joint preparation and affected dimensions are acceptable.

C. Preformed, Foam Joint Seals: Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide anchoring devices for installation.

B. Provide templates and rough-in measurements.

C. Preformed, Foam Joint Seals
1. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
   a. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   b. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      1) Concrete.
      2) Masonry.
      3) Unglazed surfaces of ceramic tile.
   c. Remove laitance and form-release agents from concrete.
   d. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:
      1) Metal.
      2) Glass.
      3) Porcelain enamel.
      4) Glazed surfaces of ceramic tile.
2. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.
3. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor components to substrate to prevent misalignment.

D. Install fire-rated systems where required.

E. Installation of Preformed, Foam Joint Seals:
1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

F. Installation of Preformed, Rubber Joint Seals:
1. Remove and repair all unsound substrate. Joint opening sidewall interface areas must be clean and dry prior to installation.
2. Prepare joint opening - surfaces must be sound, dry, by sandblasting free laitance, curing agents or foreign matter.
3. Uncoil seal and allow it to relax in the sun for as long as possible before installation.
4. Joint opening must be blown with compressed air immediately prior to seal installation.
5. Clean and prepare sidewalls of the seal and joint opening interface per the installation guidelines.
6. Apply a thin layer of the polyurethane lubricant adhesive to the sides of the seal (enough to fill the ribs) and to the sidewalls of the expansion joint opening.
7. Install the seal by pushing it into the joint opening with a blunt/flat metal bar.

8. Position seal according to dimensional guidelines.
9. Clean excess adhesive from seal and concrete.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

B. Do not permit traffic over unprotected floor joint surfaces.

C. Provide removable coating to protect finish surface.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 11 00

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hollow metal doors and frames, sidelight frames, and borrowed light frames.

B. Related Sections:
1. Section 08 14 23 - Plastic-laminate-faced Wood Doors.
2. Section 08 71 00 - Door Hardware: hardware locations.
3. Section 08 80 00 - Glazing: glass for doors, sidelights, and borrowed lights.
4. Section 09 91 00 - Painting: finishing of hollow metal doors and frames.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Include door sizes, construction, frame types, wall anchors, and accessories required for installation.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for fire rated requirements of metal door/metal frame and wood door/metal frame assemblies.

B. Fire Rated Door Construction: Conform to NFPA 252 or UL 10C.

1.4 QUALITY ASSURANCE

A. Standard: Provide steel doors and frames complying with the Steel Door Institute SDI-100 and as herein specified. Hollow metal provider that is not a member of the Steel Door Institute is not approved and must submit product data and samples for review.

B. Fire-Rated Door Assemblies: Provide door and frame assemblies which are identical in materials and construction to units tested in door and frame assemblies per NFPA 252 and which are labeled and listed for ratings indicated by UL. Metal UL classification markers shall be attached to these doors and frames.
1. Test Pressure (positive-pressure testing): After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

C. Conform to requirements of SDI-100.

D. Installed frame and door assembly to conform to UL 10C for fire-rated class indicated or scheduled.

E. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal doors and frames to the project site with no dents or open seams and store upright in a protected dry area. Provide packaging and wrapping to protect hollow metal items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide steel doors and frames as manufactured by one of the following:
Ceco Door Products; an ASSA ABLOY Group Co.
Curries Company; an ASSA ABLOY Group Co.
Deansteel Mfg., Inc.
Mesker Door, Inc.
Republic Builders Products Co.
Steelcraft; an Ingersoll-Rand Co.

2.2 MATERIALS

A. Sheet and Strip: ASTM A 1008, commercial quality, leveled, cold-rolled steel free of scale and other surface defects.

2.3 FABRICATION

A. Flush Steel Doors: Full flush type of welded seamless construction with no visible seams or joints on faces or vertical edges.
1. Face sheets of 18 gage steel reinforced, stiffened and sound-deadened by laminating to small cell impregnated kraft honeycomb core completely filling the door or by formed steel vertical stiffeners spaced 6" o.c. and attached to face sheets by spot welds and with the spaces between stiffeners filled with inorganic blanket insulation material. At exterior doors, provide insulation value of R - 8.0 for foamed-in-place polyurethane. At fire rated doors, provide mineral fiberboard core as scheduled and/or as required to meet applicable codes.
2. Continuous vertical interlocking joints on lock and hinge edges with seams continuously welded, filled and dressed smooth. Bevel vertical edges.
3. Top and bottom edges closed with continuous recessed steel channels spot welded to both faces. Top edge of exterior doors sealed flush with closing channel to exclude water.
4. Fixed glass moldings welded to security side of door. Loose moldings of 20 gage steel fastened with countersunk flat head screws. Fabricate stops to receive vinyl gaskets.
5. Overlapping steel astragals for pairs of labeled doors as required by manufacturer to meet codes.

B. Steel Frames: Combination buck, frame and trim type of 16 gage steel for interior frames and 14 gage steel for exterior frames. Provide frames with face width, throat opening, backbend, and jamb depth as per dimensions shown.
1. Brake-form to profile free of warp, buckles, and fractures with corners square and sharp. Form stop integral with frame except where detailed otherwise. Dress sheared edges straight and smooth.
2. Close corner joints tight with trim faces mitered and continuously welded. Dress exposed welds flush and smooth.
3. Fabricate frames for large openings in knocked-down sections for field assembly with butt joints and internal reinforcing sleeves. Knocked-down frame assemblies shall be trial assembled in the shop.
4. Loose glazing stops shall be 16 gage steel, mitered corners, fastened with countersunk flathead screws. Fabricate stops to receive vinyl gaskets.
5. Weld 14 gage steel floor anchors inside each jamb with two holes each anchor for floor anchor bolts.
6. Furnish frames with steel spreader temporarily fastened to the feet of both jambs for rigidity during shipping and handling.
7. For each jamb in masonry construction provide 3 or more 16 gage adjustable jamb anchors of the T-strap type spaced not more than 30" apart. Furnish yoke type Underwriters anchors for labeled door openings only.
8. For each jamb in steel stud construction provide 4 or more 18 gage drywall type jamb anchors. Weld anchors inside each jamb and wire or bolt to the studs.

C. Shop Finish: After fabrication, doors and frames shall be degreased, phosphatized, and factory painted inside and out with a rust inhibitive synthetic primer. Apply mineral filler to eliminate weld scars and other blemishes.

D. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.

E. Reinforce frames wider than 48" with roll formed steel channels fitted tightly into frame head, flush with top.

F. Prepare frame for silencers. Provide three single rubber silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors without mullions.

G. Attach fire-rated label to each frame and door unit.

H. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.

I. Fabricate frames for masonry wall coursing with 2" head member.

2.4 HARDWARE PREPARATION

A. Prepare doors and door frames for hardware. Mortising, reinforcing, drilling, and tapping shall be done at the factory for mortised hardware. Reinforcement shall be provided for surface-applied hardware, and the drilling and tapping for this hardware shall be done in the field. Provide plaster guards for hinge and strike reinforcements and cutouts on frames.

B. Reinforcement plates in doors and frames for hardware shall be 7 gage for hinges and 12 gage for all other hardware.

C. Punch for and install rubber silencers on all interior hollow metal door frames. Furnish 3 silencers for each single door and 2 silencers for each pair of doors. Set out and adjust strikes to provide clearance for the silencers. Omit silencers on exterior door frames.

2.5 CLEARANCES

A. Doors shall have pre-fit clearances of:
   1. At Head and Lock Stile: 1/8".
   2. At Hinge Stile: 1/16".
   3. At Door Sill:
      a. Without Threshold: 1/8" from bottom of door to top of decorative floor finish or covering.
      b. With Threshold: 1/8" from bottom of door to top of threshold.
   4. Between meeting edges of pair of doors: 1/8".

B. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80. Bevel fire-rated doors 1/8" in 2" in lock edge.

2.6 ACCESSORIES

A. Rubber Silencers: Resilient rubber.

B. Anchors: Three per jamb, typically, of type to suit supportive construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

3.2 INSTALLATION

A. Install frames in accordance with SDI-105.

B. Install doors in accordance with DHI.

C. Install fire-rated frames and place fire-rated doors in accordance with NFPA 80.

D. Coordinate with masonry and wallboard construction for anchor placement.

E. Coordinate installation of glass and glazing.

F. Install doors accurately in frames, maintaining specified clearances.

G. Setting Frames:
1. Check frames for rack, twist and out-of-square, and correct.
2. Set frames accurately to maintain scheduled dimensions, hold head level and maintain jambs plumb and square.
3. Anchor frames securely to adjacent construction. Anchor to floor at each jamb with two bolts to prevent twist.
4. Leave spreader bars in place until frames have been permanently built into the walls.
5. Install fire-rated frames in accordance with NFPA 80.

H. Hanging Doors:
1. Fit and hang the doors to maintain specified door clearances. Metal hinge shims are acceptable to maintain clearances.
2. Doors shall be out of wind and shall operate smoothly and quietly after adjustment.
3. Place fire-rated doors with clearances as specified in NFPA 80.

3.3 TOLERANCES

A. Maximum Diagonal Distortion: 1/8" measured with straight edge, corner to corner.

END OF SECTION

SECTION 08 14 23

PLASTIC-LAMINATE-FACED WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Solid core plastic-faced wood doors.
2. Fire-rated plastic-faced wood doors.

B. Related Sections:
1. Section 08 11 00 - Hollow Metal Doors and Frames: hollow metal frames.
2. Section 08 71 00 - Door Hardware: location of hardware.
3. Section 08 80 00 - Glazing: glass for doors.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Indicate sizes, construction, core materials, edge banding dimensions and stop profile.

C. Product Data: Indicate door core materials and construction; type and characteristics.

D. Samples:
1. Submit a sample, 6" by 6", of each plastic laminate finish and color selected.
2. Submit a 12" x 12" sample of solid core door panel indicating construction, core, face and edge detail.
3. Submit 8-1/2" x 11" paint color samples of door glazing frame paint.

E. Certificates: Submit certification that doors comply with reference standards fabrication requirements, signed by authorized representative of door manufacturer.

1.3 QUALITY ASSURANCE

A. Standard: Comply with the requirements of "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program" as published by Architectural Woodwork Institute.

B. Fire-Rated Wood Doors: Provide plastic faced wood doors which are identical in materials and construction to units tested in door and frame assemblies per NFPA 252 and which are labeled and listed for ratings indicated by UL or Warnock Hersey. Provide metal UL or Warnock Hersey classification markers attached to door.
1. Test Pressure (positive-pressure testing): After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

C. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Fire Door Construction: Conform to NFPA 252.

B. Installed Fire-Rated Door Assembly: Conform to NFPA 80 for fire-rated class as scheduled.

1.5 DELIVERY

A. Deliver doors to the project site ready for installation and to receive hardware. Each unit shall be individually plastic wrapped at the factory for protection in transit and storage.

1.6 WARRANTY

A. Special Warranty: Provide Life-of-Installation warranty on manufacturer's standard form, signed by manufacturer, installer, and contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section. Warranty shall specifically include installation of replacement doors required during term of the warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide plastic laminate faced wood doors as manufactured by one of the following:
Eggers Industries, Architectural Door Div.
Marshfield DoorSystems, Inc.
VT Industries, Inc.

2.2 MATERIALS AND FABRICATION

A. Flush Doors: Premium Grade, PC-HPDL-3 (3-ply), as defined in Section 1300 of AWI Quality Standards.
1. Core: Particleboard meeting Type I, Density C, Class 1 of CS 236.
2. Stiles: Vertical edges at least 1-1/8" and bonded to core. Species shall be close grain hardwood with factory-painted finish to match faces.
3. Rails: Top and bottom rail edges at least 1-1/8" and bonded to core. Mill option.
4. Faces: HGS (nominal 0.048") high pressure decorative laminated plastic conforming to NEMA LD 3. Laminate to be bonded to both faces. Fire-rated plastic laminate faced wood doors shall be surfaced with fire-rated (UL Stamped) laminated plastic sheet. Color shall be as selected by Architect from manufacturer's full color and pattern range. Product/manufacturer; one of the following:
Formica Brand Laminate; Formica Corp.
Nevamar; TexMar, Inc.
Pionite Decorative Laminate; Pioneer Plastics Corp.
Wilsonart; Ralph Wilson Plastics Co.
5. Stops: Provide shop primed metal glazing frames at all light openings. Fasten by through-bolted countersunk flathead screws. Field painted color as selected by Architect.

B. Labeled Doors:
1. " B" Label Doors (90-minute): AWI Type FD 1-1/2 non-combustible solid mineral core with chemically treated hardwood edge banding and fire-retardant cross banding. Pairs of "B Label" doors shall be furnished with necessary metal edge and astragal trim if required by door manufacturer to meet code requirements.
2. Smoke Control Door Labeling: Smoke control doors shall show the letter "S" on the fire rating label of the door. The marking shall indicate that the door and frame assembly are in compliance when listed or labeled gasketing is also installed.
3. Cut-outs for vision panels in fire-rated doors shall be factory cut. No field cutting shall be permitted.
4. Stops: Provide listed shop primed metal glazing frames at all light openings. Fasten by through-bolted countersunk flathead screws. Field painted color as selected by Architect.

C. Fitting:
1. Cutouts for mortise hardware shall be made to template at the factory.
2. Top and bottom rail edges and core exposed by cutouts for hardware shall be factory sealed.
3. Doors shall have pre-fit clearances of:
a. At Head and Lock Stile: 1/8"
b. At Hinge Stile: 1/16"
c. At Door Sill:
1) Without Threshold: 1/8" from bottom of door to top of decorative floor finish or covering.
2) With Threshold: 1/8" from bottom of door to top of threshold.
d. Between meeting edges of pair of doors: 1/8"
4. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80. Bevel fire-rated doors 1/8" in 2" in lock edge.

2.3 ADHESIVE

A. Facing Adhesive: Type I - waterproof.

2.4 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Fabricate fire-rated doors in accordance with AWI Quality Standards and to UL or Warnock-Hersey requirements. Attach fire-rating label to door.

C. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.

D. Fit door metal edge trim to edge of stiles after applying veneer facing.

E. Bond edge banding to cores.

F. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through-bolted hardware.

G. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify frame opening conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 PREPARATION

A. Condition plastic faced wood doors to the average prevailing humidity in the building prior to fitting and hanging.

3.3 INSTALLATION

A. General: Installation of doors shall comply with the applicable requirements of Section 1700 Installation of Architectural Woodwork (Interior) of the AWI Quality Standards.

B. Hang doors to maintain uniform clearances. Doors shall be out of wind and shall operate smoothly and quietly after adjustment. Replace doors damaged during installation.

C. Cutting and fitting of plastic laminate faced doors at the project site will not be permitted. Doors which do not fit properly shall be replaced.

D. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80. Trim stiles and rails of fire-rated doors only to extent permitted by labeling agency.

E. Pilot drill screw and bolt holes.

F. Machine cut for hardware. Core for handsets and cylinders.

G. Coordinate installation of doors with installation of frames specified in SECTION 08 11 00 - HOLLOW METAL DOORS AND FRAMES and hardware specified in SECTION 08 71 00 - DOOR HARDWARE.

H. Coordinate installation of glass and glazing**.**

3.4 INSTALLATION TOLERANCES

A. Conform to AWI requirements for fit and clearance tolerances.

B. Maximum Diagonal Distortion (Warp): 1/8" measured with straight edge or taut string, corner to corner, over an imaginary 36" x 84" surface area.

C. Maximum Vertical Distortion (Bow): 1/8" measured with straight edge or taut string, top to bottom, over an imaginary 36" x 84" surface area.

D. Maximum Width Distortion (Cup): 1/8" measured with straight edge or taut string, edge to edge, over an imaginary 36" x 84" surface area.

3.5 ADJUSTING

A. Adjust work under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 31 00

ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wall and ceiling access doors.

B. Related Sections
1. Section 03 30 00 - Cast-In-Place Concrete: Openings in concrete.
2. Section 04 20 00 - Masonry Units: Openings in masonry.
3. Section 09 21 16 - Gypsum Board Assemblies: Openings in gypsum board walls and ceilings.
4. Section 09 30 13 - Ceramic Tiling.
5. Section 09 91 00 - Painting: Field paint finish.
6. Division 22 - Plumbing components requiring access.
7. Division 23 - Mechanical components requiring access.
8. Division 26 - Electrical components requiring access.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with UL requirements for fire-rated doors.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire-rated access units.

1.5 COORDINATION

A. Coordinate work under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Coordinate the work with mechanical and electrical work requiring access units.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide wall and ceiling access doors as manufactured by one of the following:
J.L. Industries, Inc.
Karp Associates, Inc.
Larsen’s Mfg. Co.
Milcor Limited Partnership
Nystrom Building Products Co.

2.2 GENERAL

A. Flush metal panel access doors.

B. Size: As required for ease of access, but not less than 12" x 12".

C. Material:
1. Model M3202: Painted steel 14 gauge frame and door.
2. Model MS3202: Stainless steel 16 gauge frame and door.
3. Models DW3203 and K3200: Painted steel 16 gauge frame; 14 gauge door.
4. Model ATR3204: Painted steel 16 gauge frame; 18 gauge door.

5. Fire-Rated Model 3218: Painted and stainless steel 14 gauge frame; 20 gauge door.

D. Lock: Screwdriver operated, with metal cam.

2.3 ACCESS UNITS - WALLS

A. Non-Fire-Rated Door and Frame Unit:
1. In Cast-in-Place Concrete: Model M3202 (painted) manufactured by Milcor.
2. In Masonry: Model M3202 (painted) manufactured by Milcor.
3. In Ceramic Tile on Gypsum Board on Steel Studs: Model MS3202 (stainless steel) manufactured by Milcor.
4. In Gypsum Board on Steel Studs: Model DW3203 (painted) manufactured by Milcor.
5. In Plaster on Metal Furring: Model K3200 (painted) manufactured by Milcor.

B. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
1. In Cast-in-Place Concrete: Model 3218 (painted) manufactured by Milcor.
2. In Masonry: Model 3218 (painted) manufactured by Milcor.
3. In Ceramic Tile on Gypsum Board on Steel Studs: Model 3218 (stainless steel) manufactured by Milcor.
4. In Gypsum Board on Steel Studs: Model 3218 (painted) manufactured by Milcor.
5. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

2.4 ACCESS UNITS - CEILINGS

A. Non-Fire-Rated Door and Frame Unit:
1. In Gypsum Board on Metal Furring: Model DW 3203 manufactured by Milcor.
2. In Plaster on Metal Furring: Model K3200 manufactured by Milcor.
3. In Metal T-Bar Ceiling: Model ATR 3204 manufactured by Milcor.

B. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
1. In Gypsum Board on Metal Furring: Model 3218 manufactured by Milcor.
2. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

2.5 FINISHES

A. Painted Finish: One coat baked enamel primer with baked enamel finish, color as selected by Architect.

B. Stainless Steel: No. 4 finish.

C. Aluminum: Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Field Measurements: Verify that rough openings for door and frame are correctly sized and located.

3.2 INSTALLATION

A. Verify substrate conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that rough openings for door and frame are correctly sized and located.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum entrance and storefront systems with associated aluminum doors.

B. Related Sections:
1. Section 07 92 00 - Joint Sealants: caulking of perimeter joints.
2. Section 08 71 00 - Door Hardware; hardware for aluminum doors.
3. Section 08 80 00 - Glazing.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Include drawings showing elevations of each entrance and storefront type, detail sections of typical composite members, and glazing details.

C. Samples: Submit for approval duplicate samples showing the limits of color range to which the entrance, storefront, and door materials will be processed. Samples shall be representative of the materials to be furnished, and the color of the installed materials shall be within the range of the approved samples.

D. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

1.3 SYSTEM DESCRIPTION AND PERFORMANCE

A. Architectural Requirements
1. Drawings are diagrammatic and do not purport to identify or solve problems of thermal or structural movement, glazing or anchorage.
2. Requirements shown by details are intended to establish basic dimensions of units, sightlines and profiles of members.
3. Provide concealed fastening wherever possible.
4. Provide continuous snap-in aluminum backer plate at head and jamb conditions.

B. Structural Requirements
1. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170°F. without causing detrimental effects to system or components.
2. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with building code, and measured in accordance with ANSI/ASTM E 330.
3. Limit mullion deflection to L/175, or flexure limit of glass with full recovery of glazing materials, whichever is less.
4. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.
5. Storefront manufacturer shall be responsible for design and engineering of storefront system, including necessary modifications to meet specified requirements and maintaining visual design concepts.
6. Attachment considerations shall take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
7. Design anchors, fasteners and braces to be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
8. Engineer storefront and entrances to be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

C. Environmental Requirements
   1. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior. No leakage shall occur in wall when tested in accordance with ASTM E 331 at test pressure of 2.86 lbs/sq ft.
   2. Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of assembly surface area, measured at a reference differential pressure across assembly of 1.57 lbs/sq ft. as measured in accordance with ANSI/ASTM E 283.
   3. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

1.4 QUALITY ASSURANCE

A. Erector Qualifications: Erection of the entrance and storefront systems and doors shall be by an experienced erector approved by the manufacturer.

B. Design Criteria:
   1. Deflection of glass framing members under design loads shall not exceed L/175 or ¾", whichever is less.
   2. Deadload deflection of horizontal glass framing members shall not exceed 0.125".
   3. Exterior Entrances and Storefront: Design windload shall be 22 psf.

C. Perform work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle system components under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS.

B. Store and protect system components under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

C. Provide wrapping to protect prefinished aluminum surfaces.

1.6 COORDINATION

A. Manufacturer shall be responsible for details and dimensions not controlled by job conditions and shall show on his shop drawings required field measurements beyond his control.

B. Coordinate with responsible trades to establish, verify and maintain field dimensions and job conditions.

1.7 ENVIRONMENTAL CONDITIONS

A. Do not install sealants when ambient temperature is less than 40°F. during and 48-hours after installation.

1.8 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Water leakage through fixed glazing and framing areas.
      e. Failure or operating components to function properly.
   2. Warranty Period: 2 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design shall be **Tubelite, Inc**. Provide aluminum entrances and storefronts as manufactured by one of the following:
   EFCO Corp.
   Kawneer North America
   Oldcastle Building Envelope
   Tubelite, Inc
   YKK AP America, Inc.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221; AA 6063-T5 alloy, temper.

B. Sheet Aluminum: ASTM B 209; 5005-H16 alloy, temper.

C. Sheet Steel: ASTM A 446; hot-dipped galvanized.

D. Steel Sections: ASTM A 36; shapes to suit mullion sections.

E. Primer and Touch-Up Primer for Galvanized Surfaces: High-zinc-dust-content paint complying with SSPC-Paint 20.

F. Fasteners: Stainless steel.

2.3 FABRICATED COMPONENTS

A. General: Form section true to details with clean, straight, sharply defined profiles, free from defects impairing strength or durability.

B. Framing:
   1. Basis of Design Framing Types:
      a. Exterior: Tubelite T24650 Series 2” x 6-1/2” where shown on drawings. Thermally broken framing system.
      b. Interior: Tubelite 4500 Series 1-3/4" x 4-1/2" where shown on drawings.
   2. Fabricate the aluminum entrance and storefront systems with the shapes and sections detailed.
   3. Design the glass framing system to minimize loads on the glass due to building movement and incorporate provisions for thermal expansion by means of expansion joints. Where insulating glass is to be installed, design the glass framing system so that moisture does not accumulate in the glazing channel for prolonged periods.
   4. Construction: Mill joints to a hairline fit. Assemble and connect members to form rigid, watertight assemblies. No exposed fastenings will be permitted. Reinforce the framing internally as required to meet the design criteria specified above.
   5. Continuous Solid Closures: Fabricate required closures and covers to detail of aluminum sheet, plate, and angles. Provide solid continuous back plate closures at head and all jambs.
   6. Accessories: Provide glazing gaskets, flashing, and miscellaneous shims and other parts detailed or otherwise required to complete the work.
   7. Provide manufacturer's standard closure plate at perimeter framing members to cover open side of framing member against surrounding construction.

C. Doors: Tubelite Monumental Doors and Frames. The aluminum doors shall be wide-stile type with 5" stiles, 6-1/2" top rail, 5" intermediate rail (centered on panic device) and 10¼" bottom rail; square glazing stops. Construction: Doors shall be mortised and have reinforced welded corner construction with hairline watertight joints. Fastenings shall be concealed.
   1. Doors shall be factory fabricated by aluminum entrance and storefront manufacturer.
   2. Glazing Beads: Fixed or theft proof snap-in glazing beads on exterior or security side of doors. Interior glazing beads shall be snap-in type. All glazing beads shall have vinyl inserts and glazing gaskets.
   3. Weatherstripping: Continuous contact weatherstripping on stiles and top rails of exterior doors.

D. Hardware Preparation: Prepare and reinforce doors and door frames for hardware.
   1. Mortising, reinforcing, drilling, and tapping for mortised hardware shall be done at the factory.
   2. Wherever possible, concealed steel reinforcement for surface-applied hardware shall be installed at the factory. The drilling and tapping for surface-applied hardware shall be done in the field.

E. Reinforced Mullion: Same profile as non-reinforced frames, of extruded aluminum cladding with internal reinforcement of steel shaped structural section.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oilcanning"; of proper alloy to match the finished extrusions.

G. Extruded Aluminum:
   1. Framing System: Principal extrusions shall have a minimum wall thickness of 0.08". Moldings, trim, and glass stops shall be not less than 0.050" thick.
   2. Doors and Door Framing System: Principal extrusions shall have a minimum wall thickness of 3/16" (.1875 inch). Moldings, trim, and glass stops shall be not less than 0.050" thick.

H. Reinforcement: Concealed reinforcements for hardware in doors and frames and mullions shall be plated or galvanized steel and shall be secured in place.

I. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

J. Rigidly fit and secure joints and corners with internal reinforcement, except that door corners will be welded. Make joints and connections flush, hairline, and weatherproof.

K. Develop drainage holes with moisture pattern to exterior.

L. Prepare components to receive anchor devices. Fabricate anchorage items.

M. Arrange fasteners, attachments, and jointing to ensure concealment from view.

N. Prepare components with internal reinforcement for door hardware.

O. Reinforce framing members for imposed loads.

2.4 HARDWARE

A. Weatherstripping: Provide Polymeric Weathering system, continuous at head, jamb, sill, and meeting stile.

B. Refer to SECTION 08 71 00 - DOOR HARDWARE for balance of hardware.

2.5 FINISHES

A. Finish coating to conform to AAMA 611. Finish for aluminum storefront and entrances, shall match.

B. Aluminum Finish: Exposed aluminum surfaces of entrances, storefronts, frames, doors, and all their associated parts shall be Architectural Class I AA-M10C22A44 Hard Coat Color Anodic Coating Dark bronze color, .7 mil minimum. Screw and bolt heads exposed to view shall be finished to match the exposed aluminum surfaces.

C. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A 123 to 2.0 oz/sq ft.

D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive entrances and storefronts for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

B. Field check dimensions, elevations, and slopes on the connecting work affecting the entrance and storefront to assure a proper fit and weathertight installation.

C. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

3.2 INSTALLATION

A. Install wall system, doors, and glazing in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window.

B. Erecting Storefronts: Erect the members to be plumb, level, square and in proper alignment with other work, and free from sags, waves and buckles.
   1. Materials shall be accurately cut and fitted and rigidly anchored in place to resist safely all normal stresses to which the work will be subjected.
   2. Cut and machined ends and recesses shall be true, accurate and free of burrs and rough edges.
   3. Create end dams at ends of window heads, at edges of storefronts, and other vertical elements to channel water to nearest weep hole away from window mullions and other items which might allow water to travel vertically.
   4. Provide clearance around the perimeter between entrance and storefront metal and the opening substrate (concrete, masonry, or stucco) for caulking.

C. Hanging Doors: Fit the doors with hardware and hang to operate smoothly, without bind or chatter.
   1. Where concealed reinforcement for hardware cannot be provided, install and use Riv-Nuts for fastening surface applied hardware.
   2. Use sex bolts and nuts for fastening closers and closer arms to aluminum doors.
   3. The use of sheet metal or self-tapping screws to mount hardware is prohibited.

D. Sealing Joints: Seal the metal-to-metal framing joints properly with butene tape and sealant in conformance with the manufacturer's standard procedure.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install hardware using templates provided. Refer to SECTION 08 71 00 - DOOR HARDWARE for installation requirements.

G. Install glass and infill panels in accordance with SECTION 08 80 00 - GLAZING, using exterior dry method of glazing.

H. Install perimeter 2 part polyurethane type sealant, backing materials, and installation requirements in accordance with SECTION 07 92 00 - JOINT SEALANTS.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06" every 3' non-cumulative or 1/16" per 10', whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32".

3.4 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.5 PROTECT AND CLEAN

A. Protection of Aluminum:
   1. Protect concealed aluminum surfaces that will contact masonry, concrete and steel with neoprene gaskets or a coat of bituminous paint to prevent galvanic and corrosive action.
   2. If drainage of moisture from incompatible metal passes over aluminum, paint the incompatible metal with a coat of aluminum pigmented paint.
   3. Protect finished aluminum surfaces from staining by gypsum and cement materials until all adjacent masonry and plaster work has been completed.

B. Cleaning: Upon completion of the work, wash down aluminum surfaces with water and soft cloths and leave in first class condition.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Glass and glazing accessories.

B. Related Sections:
1. Section 07 92 00 - Joint Sealants
2. Section 08 11 00 - Hollow Metal Doors and Frames.
3. Section 08 14 23 - Plastic-laminate-faced Wood Doors.
4. Section 08 41 13 - Aluminum-framed Entrances and Storefronts.

1.2 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials of this section shall provide continuity of building enclosure vapor and air barrier
1. In conjunction with materials described in SECTION 07 92 00 - JOINT SEALANTS.
2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Design and size glass to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with building code, and measured in accordance with ASTM E 330.

C. Limit glass deflection to l/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.3 SUBMITTALS

A. Submit product data and samples under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Provide data on glazing sealant. Identify colors available.

D. Samples:
1. Submit 2 samples of each type of glass (except clear glass), 12" x 12" in size, illustrating glass unit, coloration, design.
2. Submit 4" long bead of glazing sealant in color selected.

1.4 QUALITY ASSURANCE

A. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual."

B. Source Quality Control: Glass shall be identified by the manufacturer's labels of grade and quality. Temporary labels shall not be removed until final cleaning. Permanent labels on tempered glass shall not be removed.

C. Safety Glazing Standard: Where safety glass is indicated or required, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of CPSC 16 CFR Part 1201 for Category II materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glass and glazing materials during delivery, storage, and handling as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, or temperature changes, and other causes.

1.6 WARRANTY

A. Provide written 10-year warranty signed by manufacturer of insulating glass agreeing to furnish replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, and other visual indications of seal failure or performance.

B. Provide written 5-year warranty signed by manufacturer of spandrel glass agreeing to furnish replacements for those spandrel glass units developing defects of ceramic frit. Warranty covers deterioration due to normal conditions of use**.**

C. Provide written 5-year warranty signed by manufacturer of laminated glass agreeing to furnish replacements for those laminated glass units that display edge separation, delamination, and blemishes exceeding those allowed by ASTM C 1172. Warranty covers deterioration due to normal conditions of use**.**

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design products are **Vitro Architectural Glass (PPG)**: Provide glass as manufactured by one of the following:
AGC Glass North America
Guardian Industries Corp.
Technical Glass Products
Oldcastle Building Envelope
Pilkington North America, Inc. (NSG Group)
Vitro Architectural Glass (formerly PPG Glass)

2.2 GLASS

A. (CT4) Tempered Glass: ASTM C 1048, Type I, Class 1 (Clear), Quality q3 (Glazing select). Kind FT - Fully Tempered, Condition A - Uncoated surfaces, 1/4" thickness.

B. (FR) Fire- and Impact Safety-Rated Ceramic Laminated Glazing (20-180 min.): Clear, ceramic flat glass; laminated 5/163/8 inch nominal thickness; complying with testing requirements in ANSI Z97.1 and 16CFR1201 for Category I and II materials and is hose stream tested. Subject to compliance with requirements, provide one of the following:
Technical Glass Products.; FireLite Plus (800.426.0279)
Schott North America, Inc.; Pyran Platinum L (SAFTIFIRST, 888.653.3333)

C. (TT) Low-E Tempered Insulating Glass: Manufacturer's standard 1" thick pre-assembled units consisting of 2 sheets of tempered glass, ASTM C 1048, enclosing a hermetically sealed dehydrated air space; with spacers, sealant, and without protective edge banding. Metal spacers shall be finished to match finish of aluminum storefronts.
1. Thickness of Each Pane: 1/4".
2. Air Space Thickness: 1/2".
3. Interior Pane: Type I, Class 1 (Clear), Quality q3 (Glazing select), Kind FT - Fully Tempered, Condition A - Uncoated surfaces.
4. Exterior Pane: Type I, Class 2 **-** Vitro Solargray tint (Tinted Heat-Absorbing and Light-Reducing), Quality q3 (Glazing select), Kind FT - Fully Tempered, Condition A - with low-emissivity Vitro Solarban 60 coating on second surface.
5. Performance Characteristics: Low-E insulating glass shall comply with the following:
   a. Solar Heat Gain Coefficient: 0.25
   b. Winter U-value: 0.29.
   c. Visible Transmittance: 35%

D. (LT) Low-E Insulated Laminated Glass: Provide Laminated Glass within insulated unit as manufactured by Vitro Architectural Glass (PPG Industries)
   1. Conformance: ASTM C1172 and complying with testing requirements.
   2. Laminated Interior Pane:
      a. Interior Pane: ASTM C 1036, Type I, Class 1, Quality q3, Tempered; ASTM C 1048, Kind FT, 1/8" thick (3mm) Clear.
      b. Interlayer: 0.030" (0.76mm) PVB
      c. Exterior Pane: ASTM C 1036, Type I, Class 1, Quality q3, Tempered; ASTM C 1048, Kind FT 1/8" thick (3mm) Clear.
   3. Air Space Thickness: 1/2".
   4. Exterior Pane: Type I, Class 2 **-** Vitro Solargray tint (Tinted Heat-Absorbing and Light-Reducing), Quality q3 (Glazing select), Kind FT - Fully Tempered, Condition A - with low-emissivity Vitro Solarban 60 coating on second surface.
   5. Performance Characteristics: Low-E insulating glass shall comply with the following:
      a. Solar Heat Gain Coefficient: 0.25
      b. Winter U-value: 0.29.
      c. Visible Transmittance: 35%

2.3 GLAZING MATERIALS

A. Glazing Compound: Comply with ASTM C 1311 or FS TT-S-00230, one-part, non-sag acrylic polymeric sealant. Product/manufacturer; one of the following:
   Acryl-R Acrylic Sealant; Schnee-Moorehead, Inc.
   Mono 555; Tremco

B. Channel Glazing Strips; Hollow Metal Doors and Frames: Provide black vinyl channel glazing strips, Glazing Vinyl for 990 Sliders Part #6062-01 as manufactured by Kawneer.

C. Accessories: Setting blocks, tape, vinyl gaskets and spacer strips as required for a complete installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive glass for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Setting Glass: Glazing shall be done at the site by skilled glaziers in conformance with the general conditions governing glazing in the GANA Glazing Manual.
   1. Glazing of aluminum windows and storefront shall be done in conformance with the methods recommended by the manufacturer of the aluminum items. Beads or stops furnished with the items to be glazed shall be used to secure the glass in place.
   2. For interior hollow metal door and frame glazing, install channel glazing strips and place glass within glazing strips. Install the removable stop and position the channel glazing strip to seal completely the void around the glass.
   3. Verify glass sizes for required edge clearances by measuring the openings. Cut each piece accurately and fit to its particular position. Center glass in the opening vertically and horizontally. Use edge blocks in vertical jambs to prevent lateral "walking" of the glass.
   4. Glass shall have clean cut edges. Do not seam, nip, stone or strike edges, or scarf corners, and do not install glass with flared edges at the bottom. Do not bump, drag, or rest the edge of a glass light against metal or other hard objects.
   5. Set tempered glass with tong marks completely concealed or in as inconspicuous a location as possible.

3.3 CLEANING

A. Upon completion of the building, clean glass on both sides and remove labels, paint spots, putty and other defacement. Replace damaged glass with new.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal stud wall framing.
2. Furred wall framing.
3. Metal channel ceiling framing.
4. Gypsum board partitions, ceilings, and furrings
5. Finishing of panel joints.
6. Exterior Sheathing.

B. Related Sections:
1. Section 05 40 00 - Cold-Formed Metal Framing: exterior wall studs.
2. Section 07 21 00 - Building Insulation: acoustical and thermal insulation.
3. Section 07 53 00 - Single-ply Membrane Roofing: gypsum board base under roof insulation.
4. Section 07 84 00 - Firestopping.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES. Submit materials list of items proposed to be provided, manufacturer's data indicating compliance with specified requirements, and manufacturer's recommended installation procedures.

B. Submit diagrams of proposed control joint and expansion joint layout prior to starting work.

1.3 QUALITY ASSURANCE

A. Tolerances for Drywall: Do not exceed a variation of 1/8" in 10'-0" and 1/16" in 5'-0" from plumb, level, and flat (all directions) and do not exceed 1/16" offset of planes at joints between panels. Shim panels as necessary to comply with tolerances.

B. Perform Work in accordance with ASTM C 840, GA-216, GA-223 and GA-600.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: In cold weather, maintain the temperature of the building reasonably constant at no less than 55° F. during gypsum panel application and joint finishing. Provide adequate ventilation to carry off excess moisture.

1.5 DELIVERY, STORAGE, HANDLING

A. Deliver, store, handle, and protect products in conformance with manufacturer's instructions and in accordance with Section 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and Section 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store inside building, on sleepers, and out of water.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gypsum Board (20A): ASTM C 1396. Provide Type X fire-rated; 48"w x 5/8" thick by maximum permissible length gypsum board with tapered edges. Product/manufacturer; one of the following:
CertainTeed Type X; CertainTeed Gypsum
ToughRock Fireguard X Gypsum Board: G-P Gypsum Corp.
Fire-Shield Gypsum Wallboard; National Gypsum Co.
Sheetrock Brand Firecode Core Gypsum Panel; USG Corporation

B. Glass-Mat Gypsum Sheathing: ASTM C 1177, 4' x 8' x 1/2" thick water-resistant treated core with glass mats front and back. Provide one of the following manufacturers/products:
GlasRoc Sheathing; CertainTeed Corporation
DensGlass Sheathing; G-P Gypsum Corporation
eXP Extended Exposure Gypsum Sheathing; National Gypsum Company
Securock Glass-Mat Sheathing Panels; USG Corporation
1. Joint Tape: 2" wide, 10 x 10 glass mesh tape.
2. Joint Sealant: Air infiltration per ASTM E283, Water Penetration per ASTM E331 Provide one of the following sealant types approved product/manufacturer:
Silicone: SilPruf LM SCS2700 as manufactured by GE Advanced Materials
Siliconized Acrylic Latex: AC-20+ as manufactured by Pecora Corp.
Urethane: Dymonic as manufactured by Tremco Incorporated.

C. Studs: ASTM C 645. Non-loadbearing channel type roll-formed from minimum 25 gauge electro- or hot-dipped galvanized steel.
1. Provide 20 gauge studs at interior ceramic tile partitions.
2. Provide 18 gauge studs, per SECTION 05 40 00 - COLD-FORMED METAL FRAMING, at all X-bracing.

D. Slotted Top Track: Sliptrack Systems, SLP-TRK®, (phone 888.475.7875 web site: www.sliptrack.com).
1. 25 ga thick, to ASTM A653/A653M, Grade 33 with a minimum yield point of 33,000 psi, electro- or hot-dipped galvanized steel.
2. 2-1/2" down-standing legs with 1/4" wide by 1-1/2" high slots spaced at 1" on center.
3. Track width shall match stud size by manufacturer's standard length.
4. Fasteners: ASTM C 1002, self-drilling, self-tapping screws**.**

E. Furring, Framing and Accessories: Provide in conformance with ASTM C 645, GA-216, and GA-600 and as follows:
1. Cold Rolled Channels: 3/4", 1-1/2" and 2" x 9/16", 16 gauge, steel channels prime painted.
2. Furring Channels: ASTM 645, 7/8" deep x 1-1/4" face, roll-formed from 25 gauge electro-galvanized steel and furnished with galvanized wire clips.
3. Resilient Furring: 1/2" deep x 2" x 1-1/4" screw flange, 25 gage, galvanized with one leg attached only, Style RC-1 PRO™ as manufactured by ClarkDietrich Building Systems.

F. Fasteners: ASTM C 514 for nails and C 1002 for screws as follows:
1. Inserts, clips, bolts, nails or other screws as recommended by wallboard manufacturer, of type and size to suit application and to rigidly secure materials in place.
2. Self-drilling, self-tapping bugle head screws for use with power drive tool.
3. Screws: Drywall Screws, Type S Bugle Head.
4. Metal framing to structure: Power driven screw fasteners to withstand 190 lb. single shear resistance and 200 lb. bearing force when drive through structural head or base and without exceeding allowable design stress in runner, fastener, or structural support.
5. Metal to metal: 3/8", Type S or S-12, pan head screws.
6. Gypsum board to sheet metal application: Type S Bugle Head screws.
7. Gypsum board to gypsum board application: Type G screws.

G. Adhesive: Utilize adhesive meeting requirements of GA-216 over metal framing.

H. Accessories:
1. Runners: ASTM C 645, channel type sections roll-formed from electro-galvanized steel with unhemmed edges. Same gauge as studs with which used.
2. Hangers: No. 8 gauge annealed, galvanized wire.
3. Tie Wire: No. 16 gauge annealed, galvanized wire.

4. Trim: Galvanized steel corner reinforcements, edge trim angles and casings; USG No. 200 series.
5. Reinforcing Tape: 2-3/16" minimum width, cross laminated, spark perforated fiber tape.
6. Joint Compound: Quick-drying, polyindurate-type, pre-fill material.
7. Joint Topping: Vinyl base all-purpose finishing material.
8. Acoustical Sealant: A one-part acrylic base sealant designed for use with drywall construction.
9. Edge Sealant: USG Sheetrock Brand W/R Sealant for use in high-moisture room areas.
10. Control Joints: Roll-formed zinc control joints with 1/4" slot (USG #093)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Workmanship: The completed gypsum wallboard surfaces shall be smooth, level or plumb, and acceptable to the finish material applicators. All joint treatment on exposed wallboard shall be invisible after painting.

B. Ceiling Furring:
1. Install in accordance with ASTM C 754, GA-216, GA-223 and GA-600 and manufacturer's instructions.
2. Space ceiling hangers 48" o.c. along runner channels and within 6" of ends of channel runs. Wrap or saddle-tie hangers around the runner channels to prevent twisting.
   a. Under steel construction, wrap hangers around or clip or bolt hangers to a structural steel member (not steel deck).
   b. Under bar joists suspend hangers from top chord or from bottom chord at panel points only.
   c. Under ductwork, employ trapeze system of hangers to support ceiling. Do not suspend hangers from ducts, piping or conduit.
3. Erect runner channels at 48" o.c. maximum and locate a channel within 4" of each parallel wall. Level channels with hangers taut and do not make kinks or bends in the hangers as a means of leveling. At channel splices, overlap ends 12" with flanges interlocked; secure each end with tie wire.
4. Erect furring channels at 16" o.c. for 1/2" thick gypsum or 24" o.c. for 5/8" thick gypsum board and at right angles to runner channels or main support members; secure with clips or saddle-tie to supports with tie wire. Make end splices by nesting channels 8" and wire tying each end.
5. At light troffers or other openings that interrupt the runner or furring channels, install additional reinforcing to restore lateral stability of the grillage.
6. No part of the suspended grillage (main runners and cross furring) shall be permitted to come in contact with abutting masonry walls and partitions.

C. Wall Furring: For gypsum wallboard over masonry, space furring channels vertically at 24" o.c. maximum and attach with power driven anchors through alternate wing flanges (staggered), spaced 24" o.c. Make end splices with 8" nested laps anchored to wall with two fasteners in each wing. Where necessary, install furring with adjustable furring brackets and 1/2" x 3/4" steel channels to which the furring channels shall be clipped or tied.

D. Partitions:
1. Follow recommendations of U.S. Gypsum Co., "Gypsum Construction Handbook".
2. Install studding in accordance with ASTM C 754, GA-216, GA-223 and GA-600.
3. Erect partitions with studs aligned to be plumb and true. Anchor studs top and bottom with runners, shoes and clips.
4. Attach floor runners to concrete slabs using shielded screws or power driven fasteners. Locate fasteners at corners and at runner ends and spaced not to exceed 24" o.c.
5. Under drywall ceilings, attach metal runner to ceiling and position studs to engage the ceiling runner. Elsewhere, extend studs above the ceiling and brace securely to the floor or roof structure above with a continuous top runner and channel braces unless specifically detailed otherwise. For fire rated partitions and where specifically detailed or noted, extend studs full height to the floor or roof structure above. Where studs extend more than 24" above finished ceiling line, provide either 5/8" gypsum board on both sides of studs or horizontal bracing at 16" o.c. attached with mechanical fasteners to both flanges of studs.
6. Space studs as shown and noted but not more than 16" o.c. Locate studs not more than 2" from abutting partitions and partition corners. Anchor studs to runner flanges with positive screw engagement where located at corners and at door frame jambs.
7. At door frame jambs of doorways up to 4'-0" wide, double the studs or reinforce with 20 gauge steel studs. At jambs of doorways over 4'-0" wide, reinforce with two 20 gauge steel studs placed back to back. Fasten reinforcing studs to the anchor clips on each door frame with bolts or screws. Place horizontally over each frame a cut-to-length section of runner track; attach with screws to the adjacent vertical studs.

8. In chase wall construction, set studs opposite each other with the flanges in the same direction and cross brace between the rows of studs with three 12" high pieces of gypsum board or three pieces of metal stud attached to each pair of studs at the quarter points with drive screws.
9. Double the studs at vertical control joints in partitions.
10. Brace partitions to top chord of the structure above with 20 ga. diagonal braces at 4'-0" o.c. minimum. Where floor to structure height exceeds 16'-0", in addition to extending and fastening studs to structure, add 20 ga. stud diagonal braces at 4'-0" o.c. minimum.

E. Slotted Top Track: Install slotted track in strict accordance with manufacturer's written instructions and recommendations.
1. Secure studs to slotted top track with #8 wafer-head screws.
2. Maintain minimum deflection gap of 0.65 inch between top of stud and top of slotted track.
3. Limit vertical movement to 1 inch, plus or minus 1/2 inch.

F. Exterior Walls: Erect the exterior walls as detailed.
1. Glass Mat Gypsum Sheathing**:**
   a. Install exterior sheathing horizontally over the outside face of metal studs (SECTION 05 40 00 - COLD-FORMED METAL FRAMING). Screw-attach sheathing to exterior of each stud with screws spaced 3/8" from ends and edges and approximately 8" o.c. Make all end joints at bearings.
   b. Seal joints with joint tape and joint sealant.
      1) Apply glass mesh joint tape to all joints, overlapping at intersections by the width of the tape.
      2) Apply approximately 3/8" bead of caulk along the joint.
      3) Embed the caulk into the entire surface of the tape with a trowel.
      4) Use backer rod for openings larger than 1/8".
      5) Apply enough caulk to each exposed fastener to cover completely when troweled smooth.
      6) Approximately rate of usage is 48 sq. ft. per 10.5 oz**.**

G. Wallboard Application:
1. Apply gypsum wallboard first to the ceilings and then to the partitions. Use maximum practical lengths to minimize end joints. Fit ends and edges closely but not forced together.
2. For single-layer ceiling application, apply wallboard with the long dimension either parallel or at right angles to the framing members. All abutting ends and edges shall occur over framing members, except in horizontal application. Stagger end joints in adjacent rows.
3. For single-layer wall application with a ceiling height of 8'-2" or less, use either the horizontal or the vertical application method. With a ceiling height over 8'-2" and for fire-rated partitions, use only the vertical application method without any exposed horizontal joints. Stagger the vertical joints on opposite sides of a partition. Extend wallboard full height to the floor or roof structure above where so detailed.
4. Fasten wallboard firmly to studs and furring channels with power-driven drywall screws. Gypsum board shall extend to within 1/4" of floor line. Drive screw heads close without cutting the surface paper or fracturing the core. Maximum screw spacing shall be 12" o.c. for ceilings and 16" o.c. for partitions. For fire-rated partitions, maximum spacing shall be 12" o.c. Do not drive screws closer than 3/8" from any edge.
5. For two-layer wall application, apply the base layer of wallboard vertically; attach with screws spaced 16" o.c. Apply the face layer vertically with joints offset 24" from base layer joints; attach with adhesive and 1-5/8" screws spaced 16" o.c.
6. Wallboard joints in single layer or in face layer of two layer applications shall not occur within 12" of the corners of door frame, window frames, and openings larger than 12" x 12", unless control joints are installed at the corners.
7. Accurately cut and fit abutting ends, edges and holes for pipes and electrical fixtures. Support the edges of gypsum wallboard at cutouts and openings.
8. Reinforce exposed external corners with metal corner reinforcement.
9. Where wallboard surfaces abut dissimilar intersecting surfaces such as metal and masonry, trim the meeting edge with a metal trim angle held approximately 1/4" away from the intersecting surface. Caulk the joint full with sealant; tool smooth.
10. After application, check all gypsum wallboard for loose fasteners; drive tight any found loose.

H. Control Joints:
1. Isolate gypsum wallboard surfaces with control joints where specifically detailed and where the following conditions exist:
   a. Partition or furring run exceeds 30 feet without a corner or a ceiling-height door frame.
   b. Ceiling dimensions exceed 50 feet in either direction.
   c. Construction changes within the plane of the partition.
   d. Each side of column furring within a partition run.

e. Above each door jamb from head to top of partition.
f. At each side of furr downs.

2. Locate control joints in partitions at less-than-ceiling-height door frames with control joints extending to the ceiling from both top corners.
3. Make joints with roll-formed zinc control joints (USG #093) with 1/4" slot.
   a. Do not install roll-formed joint behind ceramic tile. Provide a 1/4" wide gap in the substrate only.
   b. At acoustical partitions, seal behind the joints with acoustical sealant.
4. Back-block ceiling control joints with face panel strips laid over the joints.

I. Edge Sealing: On wallboard partitions to be covered with ceramic tile, treat cut edges, holes, corner joints, and intermediate joints with edge sealant before installation of wallboard panels. Treat all fastener heads with edge sealant after installation. Caulking of openings through ceramic tile is specified in SECTION 09 30 13 - CERAMIC TILING.

J. Joint Treatment:
1. Finish the joints in exposed wallboard, wallboard which is to be covered with vinyl wall covering and carpet wall covering, and wallboard in sound partitions to deck. Joints in wall board to be covered with ceramic tile shall be filled but may be left unfinished.
2. Fill the V-grooves between boards with quick drying joint compound. Wipe joints clean of excess compound and allow to harden.
3. Apply a thin layer of joint topping to joints. Immediately embed tape reinforcement over joints, follow with a skim coat of compound.
4. Apply joint topping over the tape to fill flush with the board surface.
5. Apply joint topping over the fill coat and feather out smoothly beyond fill coat edge. Sand between coats as necessary to provide a smooth surface ready for painting.
6. Fill screw head depressions flush with three coats of compound.
7. Finish metal corner reinforcements and edge and control joint trim with two or three coats of joint compound, using edge of trim as a screed to secure a smooth, flat finish.

3.2 TOLERANCES

A. Maximum variation from true flatness: 1/8" in 10 feet in any direction.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Ceramic tile.

B. Related Sections:
1. Section 07 92 00 - Joint Sealants.
2. Section 09 21 16 - Gypsum Board Assemblies.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Submit tile samples of the same size scheduled for each particular type of tile required.

C. Certificate: Furnish one master grade certificate on ceramic tile executed prior to delivery of the tile to the site.

1.3 QUALITY ASSURANCE

A. Standard: Ceramic tile shall be Standard Grade complying with the requirements of ANSI A 137.1. Deliver tile to the project site in grade sealed containers.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained.

B. Do not install adhesives in a closed, unventilated environment.

C. Maintain 50°F. during installation of mortar materials.

1.5 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the Owner’s maintenance facility one box for each type, field color, pattern, and size of ceramic tile and one box of each type, accent color, pattern, and size of ceramic wall tile installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.1 TILE

A. Ceramic tile and trim as manufactured by **Dal-Tile Corp. and Interceramic** shall set all standards in the areas of trim shapes availability, tile size, color, pattern, and texture.

B. Provide factory made fitters and trim shapes required for a finished installation. Keep job-cut fitters and trim shapes to a minimum. Provide bullnose tile at horizontal and vertical tile edges. Provide cove base where required to match existing.

C. Ceramic Tile:
1. Floor Tile (3B): 2" x 2" unglazed, impervious, porcelain tile with integral color, smooth all-purpose edges. Provide “Keystones” as manufactured by DalTile. Base shall be cove type unless specifically detailed otherwise. Colors as scheduled in SECTION 09 99 00 – COLOR SCHEDULE.
2. Floor Tile (3E-1 through 3E-7): 8" x 8", glazed, porcelain tile. Provide “Hue”, satin finish as supplied by Pantheon Tile. Colors as scheduled in SECTION 09 99 00 – COLOR SCHEDULE.

3. Floor Tile (3E-8 and 3E-9): 8" x 8", glazed, porcelain tile. Provide “Retro”, as supplied by Pantheon Tile. Colors as scheduled in SECTION 09 99 00 – COLOR SCHEDULE.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, domestic manufacture.

B. Dry-Set Mortar: ANSI A 118.1, factory sanded mortar mix.

C. Latex-Portland Cement: ANSI A 118.4, flexible mortar consisting of cement-based mix and latex additive.

D. Adhesive: ANSI A 136.1, Type I, prepared organic adhesive.

E. Grout:
1. Floor: ANSI A118.6, latex modified dry-set Portland cement or commercial waterproof Portland cement grout. Color(s) shall be as scheduled in SECTION 09 99 00 - COLOR SCHEDULE from Custom Building Products, Laticrete, Mapei, or approved equivalent.
2. Walls: Modified acrylic, premixed Mastic Grout or dry-set grout complying with ANSI A118.6, Color(s) shall be as scheduled in SECTION 09 99 00 - COLOR SCHEDULE from Custom Building Products, Laticrete, Mapei, or approved equivalent. If Contractor elects to provide dry-set grout, the installation shall be damp cured.

F. Lime: ASTM C 207, Type S, hydrated lime.

G. Sand: ASTM C 144, clean, masonry sand.

H. Water: Clean and potable.

2.3 ACCESSORIES

A. Metal Floor Transition Trim between Porcelain to VCT: Provide RENO-AEU protective edge trim by Schluter Systems L.P. Finish shall be satin anodized aluminum. Height as required to flush out with top of tile flooring.

B. Metal Corner Trim and Tile Wall Top Cap: Provide RONDEC satin anodized aluminum corner trim by Schluter Systems L.P.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sweep concrete slab surfaces clean and free of dirt and debris. Remove oil, grease, paint, and dried mortar.

3.2 INSTALLATION

A. General Workmanship:
1. Center and balance areas of tile, if possible.
2. Do not make an excessive amount of cuts. Usually, no cuts smaller than half size should be made. Make all cuts on the outer edges of the field.
3. Smooth cut edges. Install tile without jagged or flaked edges.
4. Fit tile closely where edges will be covered by trim, escutcheons or other similar devices.
5. The splitting of tile is expressly prohibited except where no alternative is possible.
6. Maintain the heights of tilework in full courses to the nearest obtainable dimension where heights, given in feet and inches, are not required to fill vertical spaces exactly.
7. Make corners of all tile flush and level with corners of adjacent tile, with due allowance to tolerances for tile as specified in ANSI A137.1.
8. Keep all joint lines straight and even width, including miters.
9. Thoroughly back-up with thin-set bonding material all thin-set units, molded or shaped pieces; secure firmly in place.
10. Thoroughly back-up with mortar-bed mix thick-bed nosings, coves, curbing, gutters, flat tile and trimmers, molded or shaped pieces; secure firmly in place.

11. Bond coat mix shall not be used to back-up thick-bed trim and angles. Coat all thick-bed trim shapes with 1/32" to 1/16" of bond coat mix.
12. Finish floor and wall areas level and plumb with no variations exceeding 1/8" in 8' from the required plane.
13. Install accessories in tile work to be evenly spaced, properly centered with tile joints, and level, plumb and true to the correct projection. Install accessories at locations and heights designated.
14. Finished tile work shall be clean. Replace pitted, chipped, cracked and scratched tiles.

B. Setting Floor Tile - Thinset:
   1. Set floor tile in straight joint pattern using dry-set cement mortar in conformance with ANSI A 108.5.
   2. Mix and apply dry-set mortar in conformance with the manufacturer's recommendations. Cover surface evenly and comb with a notched trowel not more than 10 minutes before applying tile.
   3. Set tile before initial set of the mortar has taken place. Press and beat tile firmly into place to establish proper and complete bond. Joints shall be close and uniform.

C. Setting Wall Tile:
   1. Set base and wall tile over masonry in straight joint pattern using dry-set cement mortar in conformance with ANSI A 108.5.
   2. Set base and wall tile of size less than 12" x 12" over gypsum wallboard in straight joint pattern using organic adhesive in conformance with TCA W242 and ANSI A 108.4.
   3. Set base and wall tile of size more than 12" x 12" over gypsum wallboard in straight joint pattern using Latex Portland cement mortar in conformance with TCA W243 and ANSI A 108.5.
   4. Surfaces to be tiled shall be dry, firm and proper for bond.
      a. Treat gypsum wallboard surfaces with a primer-sealer; caulk openings around pipes and fixtures with a non-hardening waterproof sealant.
      b. Apply leveling coat of sanded dry-set mortar over irregular surfaces if and as required to secure plumb, flat surfaces for the application of tile.
   5. Mix and apply mortar and adhesive in conformance with best trade practice and the recommendations of the manufacturer of the materials used. Cover surfaces evenly, with no bare spots, and comb with a notched trowel within 10 minutes of applying tile.
   6. Apply tile before skinning of the adhesive or mortar has taken place. Press and beat firmly into place to obtain at least 75 percent contact area of adhesive or mortar on the tile back.
   7. If tile is face mounted, remove paper and glue before the adhesive or mortar is firmly set; adjust tiles that are out of line.
   8. Provide control joints at all inside corners of wall tile areas. Install sealant in joint. Color as selected by Architect.

D. Grouting:
   1. Force a maximum amount of grout into the joints.
   2. Clean the joints of cushion-edge tile to depth of cushion. Fill joints of square-edge tile flush with face of tile.
   3. Fill all gaps and skips. Mortar shall not show through grouted joints.
   4. Finished grout shall be uniform in color, smooth, and without voids and low spots.
   5. Grout joint width as recommended by tile manufacturer.
   6. Damp cure Portland cement grout for at least 72 hours.

E. Wall Expansion Joints: Where tile on wallboard abuts tile on masonry, provide a 1/4" caulked expansion joint to separate the two areas.
   1. After tile work and grout are dry, clean the open expansion joint and roll-in foam rod stock to leave a joint depth of 1/4".
   2. Fill the joint with primerless one-part acrylic polymeric sealant equal to "Mono" by Tremco Manufacturing Co. Color shall be white.
   3. Tool the sealant smooth.

F. Joints at Frames: Where 4-1/4" x 4-1/4" ceramic tile abuts frame, provide a 1/8" caulked expansion joint to separate tile from the frame. Where 6" x 6" ceramic tile abuts frame, provide a 1/4" caulked expansion joint to separate tile from the frame.
   1. After tile work and grout are dry, clean the joint at the frame.
   2. Fill the joint with primerless one-part acrylic polymeric sealant equal to "Mono 555" by Tremco.
   3. Color shall be white at 4-1/4" x 4-1/4" tiles and shall match adjacent grout at 6" x 6" tiles.
   4. Tool the sealant smooth.

G. Metal Floor Transition Trim:
   1. Provide at transition of ceramic floor tile to lower flooring material (e.g. vinyl composition tile, exposed concrete, etc.) where no marble threshold is detailed.
   2. Install as detailed on drawings.
   3. Set transition trim prior to installing ceramic floor tile.
   4. Set tile up tight to transition trim with a factory cushion edge. Trim shall be flush with top of ceramic tile.
   5. After tile work and grout are dry, clean the joint between the trim and the tile.
   6. Fill joint between trim and ceramic floor tile with sealant to match grout**.**

H. Metal Corner and Top of Tile Cap Trim:
   1. Provide at top and all outside corners of ceramic wall tile.
   2. Set metal corner trim prior to installing wall tile.
   3. Set tile up to corner trim with a factory cushion edge. Provide a 1/8” joint between tile and trim. Trim shall be flush with faces of ceramic tile.
   4. After tile work and grout are dry, clean the joint between the trim and the tile.
   5. Fill joint with sealant to match grout**.**

3.3 CLEANING

A. When the work of other trades is completed, clean down tile and marble surfaces and leave in first class condition.
   1. The use of wire brushes or acids is expressly prohibited.
   2. Replace cracked, broken, and chipped tile with new units.
   3. Correct uneven and stained joints.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustical panels and exposed suspension systems for ceilings.

1.2 SUBMITTALS

A. Samples: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES. Submit a 12" x 12" sample of each type of acoustic panel. Submit a 6" long sample of each component of each type of exposed suspension system.

1.3 QUALITY ASSURANCE

A. Erector Qualifications: This work shall be performed by an experienced erector approved by the acoustical material manufacturer.

B. Pre-ceiling conference:
   1. Prior to start of ceiling grid installation, convene pre-ceiling conference at project site.
   2. Attendance is required by Contractor, installer, and Architect.
   3. Review specifications and drawings of ceiling installation and layout.

1.4 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Before acoustical work is started, all wet work such as concrete and plastering shall be completed and thoroughly dried out.
   2. Acoustical ceiling shall not begin until building has been closed to the weather and suitable mechanical ventilation is supplied to maintain condition ranges of 60°F. to 85°F. at not more than 70% R.H. These conditions shall be maintained prior to, during, and after installation.
   3. Acoustical panels shall be unpacked and allowed to stabilize for a period of 72 hours, in the environment as defined above, prior to installation.

B. Work Sequence:
   1. Do not start acoustical work until mechanical and electrical work to be covered up has been inspected and approved.
   2. Coordinate the related work of other trades involved in the ceiling installation.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store tile and panel cartons open at each end to stabilize moisture content.

1.6 WARRANTY

A. Acoustic Lay-in Panels: Submit manufacturer's standard 10-year warranty against sagging or warping (defined as greater than 1/8" measured in the panel center) from the date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acoustic Lay-in Panels (22A): ASTM E 1264, mineral fiber panels, Class 25 (non-combustible) and having an NRC range of 0.50-0.60.
   1. Sizes: (22A) - 24" x 24" x 5/8"
   2. Design: Fine, non-directional fissured surface.
   3. Product/manufacturer; standard panels:
      Fine Fissured Humiguard; Armstrong World Industries, Inc.
      Fine Fissured Safetone; CertainTeed Corporation
      Radar ClimaPlus; USG Interiors, Inc.
   4. Finish: Washable factory applied vinyl latex paint.
   5. Edges: Square.

B. Vinyl Covered Lay-In Gypsum Board Panels (22B): Provide 24" x 24" x 1/2" thick fine texture white vinyl faced panels. Product/manufacturer; one of the following:
   Vinylrock X CRF; Certain Teed Corporation
   Sheetrock™ Lay-in Ceiling Panel ClimaPlus; USG Interiors, Inc.

C. Suspension System; Acoustic Lay-in Panels: Exposed type for panel ceilings as manufactured by the ceiling panel manufacturer or one of the following:
   Armstrong World Industries, Inc.
   CertainTeed Corp.
   Chicago Metallic Corp./Rockfon
   USG Interiors, Inc.
   1. Components shall be roll-formed from steel to meet ASTM C 635 and conform to the requirements for Intermediate duty structural classification. Exposed main tee runners shall be double web with capped face.
   2. Provide single tee adapter clips/unopposed tee clips at off-module cross tee connections where the cross tees intersect a main tee and is not locked into place with another cross tee.
   3. Components shall be electro-zinc coated or hot-dip galvanized and exposed surfaces shall have white enamel finish.
   4. System shall be designed and sized to support the ceiling assembly with a maximum deflection of L/360 of the span.
   5. Color shall be white to match color of lay-in panels.
   6. Fire resistive systems shall be UL listed and labeled for a 1-hour time-design rating.

D. Suspension System: Vinyl Coated Gypsum Board Ceilings: ASTM C 635, heavy duty, 15/16" hot dipped galvanized steel, with aluminum cap with white finish. Product/manufacturer: one of the following:
   Prelude Plus XL Fire Guard Environmental Tee System; Armstrong World Industries
   DXLA DONN Brand Acoustical Suspension System; USG Interiors, Inc.

E. Hangers: 12 gage annealed and galvanized steel wire.

F. Hold-down Clips: UHDC Universal Hold Down Clip by Armstrong.

G. Column Rings: Prefabricated clamp rings to support suspended ceiling, as manufactured by Fry Reglet.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive acoustical treatment for conditions that will adversely affect the execution and quality of work. Designate any areas of potential interference between ceiling components and components of other trades. Do not start this work until unsatisfactory conditions are corrected.

3.2 CEILING INSTALLATION

A. General: Installation procedures shall meet or exceed the manufacturer's recommendations and ASTM C 636.
   1. Lay out each area so that the panel patterns are symmetrical, joints parallel to walls and borders generally equal in width.
   2. Coordinate the patterns with ceiling lights and grilles in conformance with the reflected ceiling plans and as directed.
   3. Verify types and sizes of light fixtures and grilles to be accommodated and arrange the work accordingly.

B. Suspension: Locate main and cross tee runners to form the indicated patterns.
   1. Use a laser leveling method to direct-suspend the main tees with hangers spaced not more than 48" o.c.
   2. Provide hangers within 6" of the corners of recessed lighting fixtures.
   3. Under steel construction, wrap hangers around or clip or bolt hangers to a structural steel member (not steel deck).
   4. Under bar joists, suspend hangers from top chord or from bottom chord at panel points only.
   5. Under ductwork, employ trapeze system for hanging ceiling.
   6. Do not suspend hangers from ducts, piping, conduit, or fireproofing membrane.
   7. Use a laser beam system to level the main tee runners to within 1/8" in 12 ft. Level with hangers taut; do not make kinks or bends in hangers as a means of leveling.

C. Moldings: Install finish channel and angle moldings where ceilings abut walls, furrings and other intersecting vertical surfaces.
   1. Moldings shall be in long lengths, secured to adjoining surfaces with at least two fasteners for each piece or more as may be required. Pull the molding snugly against the vertical surface without any gaps.
   2. No molding length shall be less than 3 ft. except at short offsets.
   3. Use prefabricated corner pieces where possible to eliminate field mitering.

D. Lay-in Panels: Install the acoustic panels in the exposed suspension system with bottom surfaces flush and in a true, level plane.
   1. Hold-down clips are required at all vinyl covered gypsum panels for cleaning purposes.
   2. Provide hold-down clips at lay-in panels within 6' of exterior exits.

E. Access: Provide access through acoustic panel ceilings with one or more access locations in each room to maintain a maximum spacing of 30 ft. between access panels.

3.3 TOLERANCES

A. Variation from flat and level surface: 1/8 inch in 10 ft.

B. Variation from plumb of grid members caused by eccentric loads: Two degrees (2°) maximum.

3.4 ADJUSTING AND PATCHING

A. Replace damaged members of exposed suspension system. Replace ceiling board and tile that is damaged, installed improperly, or shows visible signs of sagging.

3.5 CLEANING

A. After installation, clean soiled and discolored surfaces. Remove damaged units and replace with new.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vinyl composition tile flooring, rubber base, and accessories.

1.2 SUBMITTALS

A. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit manufacturer's standard color samples of tile, not less than 3" x 3", full thickness. Submit samples of each accessory, full height or width by not less than 2" length.

B. Concrete Slab Testing
   1. Alkalinity and Adhesion Testing:
      a. Submit result of pH tests.
      b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
      c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
      d. Proceed with installation only after substrates pass testing.
   2. Relative Humidity Probe Tests:
      a. Submit results for in situ relative humidity probe tests.
      b. Submit date and time measurements were made.
      c. Submit locations and depth of probe holes.
      d. Submit temperature and relative humidity in each probe hole.
      e. Submit ambient air temperature.
      f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
      g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.
   3. Anhydrous Calcium Chloride Testing
      a. Submit time and date of placement and retrieval.
      b. Submit ambient air temperature and humidity during test duration
      c. Submit manufacturer’s instructions and relative technical data.
      d. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty**.**

1.3 DELIVERY

A. Deliver floor materials to the project site in unbroken containers and cartons bearing the manufacturer's labels.

B. Deliver resilient floor materials to an acclimatized building at least 36 hours prior to installation of vinyl composition tile and 48 hours for installation of rubber products.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: Maintain the temperature inside the building reasonably constant at not less than 65°F. for 48 hours before installation, during installation, and for 48 hours after installation.

B. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55°F. or more than 95°F.

1.5 WARRANTY

A. Vinyl Composition Tile Warranty Terms: Standard 5-year manufacturer's warranty on defective materials. Reasonable labor costs will be reimbursed at 100% if the defect is reported within the first year of the original purchase, and at 50% if the defect is reported within the second year of the original purchase. Labor costs will not be reimbursed if the defect is reported within the third, fourth, or fifth year of the original purchase.

B. Rubber Base Warranty: Provide Standard 2-year manufacturers' warranty that materials is free from manufacturing defects**.**

1.6 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the Owner's maintenance facility not less than one box or fraction thereof for each type, field color, pattern, and size installed and one box or fraction thereof for each type, accent color, pattern, and size installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Composition Tile (15A): ASTM F 1066, Class 2 (through-pattern tile), 12" x 12" x 1/8" thick vinyl composition tile as manufactured by one of the following:
Standard Excelon Imperial Texture and Multicolor; Armstrong Flooring Div.
Essentials and Designer Essentials; Mannington Commercial
Standard Patterns; Azrock by Tarkett

B. Rubber Base (14B): ASTM F 1861, Type TS (rubber, vulcanized thermoset), Style Cove (with top-set toe), 1/8" thick, 4" high, color(s) as scheduled in SECTION 09 99 00 - COLOR SCHEDULE. Furnish base in manufacturer's continuous rolls. Product/manufacturer; one of the following:
Wallflowers® Premium Wall Base; Flexco
Baseworks™ Thermoset Rubber Wall Base; Johnsonite
Pinnacle Type TS Rubber Base; Roppe Rubber Corp.
NO SUBSTITUTIONS

C. Edge Strips: 1" wide by 1/8" thick black rubber tile reducer with beveled surface.

D. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by vinyl composition tile manufacturer.

E. Adhesive: Moisture-resistant type recommended by flooring manufacturer.

F. Cleaner: Neutral, chemical cleaner such as Hillyard "Super Shine-All" designed to be safe to use on any surface not damaged by water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive resilient flooring, base, and accessories for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Testing of concrete slabs
1. Anhydrous Calcium Chloride Testing
a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.

b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.
    1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
    2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
    3) Unseal dish and expose test according to preprinted test kit instructions.
    4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
    5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.
e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

2. In Situ Relative Humidity Probe Test:
    a. Conduct in situ relative humidity probe testing per ASTM F2170.
    b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
    c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
    d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.
    e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
    f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
    g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
    h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
    i. Proceed with installation only after substrates pass testing.
    j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.
3. Alkalinity and Adhesion Testing
    a. Conduct pH test per ASTM F710.
    b. Test for alkalinity prior to installation of flooring materials.
    c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
    d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
    e. Proceed with installation only after substrates pass testing.
    f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty**.**

B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Surfaces shall be clean and dry before flooring is laid.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Sweep the surfaces free of dust and dirt and remove oil, grease, paint, dried mortar and curing compound residue.
4. Fill low spots, cracks, minor holes and crevices in concrete floors with latex underlayment patching material. Re-surface rough and irregular surfaces with the same underlayment material.

3.3 INSTALLATION

A. Laying Flooring:
1. Install floor tile in straight joint pattern as directed and in conformance with the manufacturer's recommended procedure.
2. Start at centerlines of spaces and adjust borders to maintain full tiles in the field and equal borders. Except as required in irregularly shaped areas, no tile shall be less than one-half the width of field tile, and in no event shall any tile piece be less than 3" wide.
3. Install tile to square grid pattern with all joints aligned, with pattern grain alternating with adjacent unit to produce basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter. Lay tile starting at center of room working toward walls, square with room axis. Joints shall be tight butt joints, true to line.
4. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
5. Install edge strips at unprotected or exposed edges and where flooring terminates.
6. Bed tile firmly and maintain joints tight, straight, and square with the room axes. The completed surfaces shall be free of buckles, waves, and projecting tile. Scribe tiles neatly at columns, corners, and casework.
7. Where flooring edges are not concealed by thresholds or other materials, install rubber edge strips.

B. Applying Rubber Base:
1. Install coved base after the floor tile, mat, and carpet have been laid. Do not use less than manufacturer's continuous rolls, except where required for last piece in any one run of wall length.
2. Apply base with adhesive covering 100% of the back surface, not just in spots. Apply adhesive with a notched trowel. Use headless brads in addition to adhesive where required. Use preformed outside corners and miter inside corners. Joints shall be tight.
3. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Repair or replace damaged surfaces that are soiled or scarred in a manner acceptable to the Owner.

3.5 CLEANING

A. Clean in accordance with Section 01 74 13 - PROGRESS CLEANING.
1. Remove excess adhesive and other foreign matter from tile flooring and base.
2. Scrub floor with cleaner in conformance with manufacturer's instructions and rinse.
3. Do not wax flooring. Waxing will be done by Owner.
4. Replace defective or loose material.

END OF SECTION

SECTION 09 65 66

ATHLETIC SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Resilient athletic flooring.

B. Related Sections:
1. Section 09 65 00 – Resilient Flooring: Rubber base.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Product Data: Submit manufacturer's product data, including installation and maintenance instructions

C. Samples: Submit manufacturer's full range of color samples.

1.3 QUALITY ASSURANCE

A. Supplier shall be an established firm experienced in the sales and installation practices of sports flooring.

B. Installer:
1. Flooring contractor shall be experienced in the field and approved by the manufacturer.
2. Flooring contractor shall have the installation and specifications manual and be trained by the manufacturer and/or distributor.
3. Manufacturer's recommendations shall be followed for the correct preparation, finishing, and testing of the subfloor surface.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Flooring contractor shall not deliver to job site until the work of other trades has been completed (especially overhead trades).

B. Installation temperature shall be at least 65° F or maximum 86° F and the moisture content of the slab 3% or lower.

C. Rolls shall be stored upright at all times.

1.5 MAINTENANCE

A. Maintenance shall not begin until 72 hours after the flooring has been installed.

B. No sealers or wax of any kind are required for material to maintain its natural finish.

C. Daily Maintenance: After the floor is installed and open to traffic, dustmop daily using Hillyard Uphold dustmop treatment or equivalent. This will effectively remove dirt, grit, and sand particles which otherwise act as an abrasive material when walked on.

D. Weekly Maintenance:
1. Approximately once a week, scrub the floor with an automatic scrubber and a solution of Hillyard Clean Scrub or equivalent. Depending upon the amount of soil, use 3 to 6 ounces of Clean Scrub or equivalent per gallon of warm water. Remove soiled cleaning solution with an automatic scrubber.
2. After the entire floor is clean and dry before traffic is allowed back on the floor, dustmop with Uphold or equivalent.

1.6 WARRANTY

A. Provide a standard warranty jointly covered by the approved flooring contractor and the manufacturer guaranteeing its materials against manufacturing defects for a period of two (2) years following the installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide “Sport M Plus” flooring as manufactured by Taraflex Sports Flooring with the following characteristics:
   1. Sport surface material shall be a homogeneous 100% pure vinyl wear layer combined with a pure vinyl closed-cell foam backing, reinforced with a fiberglass interlayer. A fungistatic and bacteriostatic treatment shall be applied throughout the thickness of the surface (wear layer and foam backing). Surface shall have a UV cured polyurethane anti-dirt treatment.
   2. Physical Properties:
      a. Surface: Pebbled embossed
      b. Width of Roll: 59” (1.50 m)
      c. Length of Rolls: 67-86’ maximum
      d. Total Thickness: .3" (7.5 mm)
      e. Wear-Layer thickness: Not less than 0.08” (2.1 mm)
      f. Backing:
         1) Very high density, two layer, dual-durometer, closed cell foam
         2) Two (2) layers of fiberglass reinforcement for dimensional stability and indentation resistance. One layer of woven grid fiberglass and an additional layer of non-woven fiberglass.
      g. Weight: 0.9 lbs. / sq. ft. (4.2 Kg / m^2)
      h. Abrasion Resistance Taber ASTM C 501: 109
      i. Static Load Limit: 200 psi
      j. Chemical Resistance ASTM D 543: Excellent
      k. Compression Set ASTM D 595B: Greater than 95% immediate recovery
      l. Linear Dimension ASTM D 1042: Less than 0.50%
      m. Fungus Resistance: ASTM D 1924: Complete
      n. Critical Radiant Flux ASTM E 648: >0.45 W/cm^2 Class 1
      o. Hardness Shore A ASTM D 2240: 81
      p. Sound Isolation ISO 717/2: Δ25dB
      q. Ball Bounce: Min 90%: Pass
      r. Shock Absorbing properties G max of playing surface systems and materials (height 15 cm) ASTM F 355: 940
   3. Seaming Method: Heat welded.
   4. Colors shall be selected by Architect from manufacturer’s complete color line.

B. Adhesive:
   1. To assure complete compatibility with the flooring material, specially compounded adhesives shall be utilized. All adhesives shall be approved by flooring manufacturer and applied in strict accordance with the manufacturer’s instructions.
   2. Full-spread adhesive coverage to completely adhere flooring to substrate.
   3. Complete adhesive coverage to eliminate the possibility of gaps or space between the slab and flooring material where moisture could accumulate and create an environment conducive to mold growth.
   4. Flooring to be fully adhered to the concrete slab in all locations eliminating the possibility of waves or wrinkles forming caused by the floor shifting, moving or by rolling loads displacing it.

C. Heat Welding Rod: As supplied by indoor resilient athletic flooring manufacturer. Color as selected by Architect to blend with resilient athletic flooring color.

D. Game-Line and Marker Paint: Complete Low V.O.C. 2-Component Polyurethane Game Line Paint System, including primer, compatible with flooring and recommended by flooring and paint manufacturers.

PART 3 - EXECUTION

3.1 PREPARATION OF THE SUBFLOOR

A. Provide a smooth, flat, concrete finish, achieved manually or mechanically. The slab will have a tolerance of ± 1/8" in a 10' radius.

B. The concrete floor temperature will have to be maintained at a minimum of 65° F during the installation and the Contractor will make sure that the moisture content does not exceed 3% (according to RMA testing method)

C. Before proceeding with any work, inspect the subfloor surface and report in writing to the Architect any visible defects on the surface such as cracks, bumps, rough areas, or variations in planarity.

D. Check for grease, oil, paint, dust, or any contamination remaining on the concrete subfloor.

E. Before proceeding with material installation, clean the concrete surface to remove any dirt or foreign materials. Sanding of the subfloor is mandatory.

F. Patch and repair all cracks, voids, and other imperfections of concrete with high-strength portland cement-based patching material – Ardex K-15. Do not use gypsum-based patching materials. If concrete is out of level, then it should be properly leveled by an experienced underlayment contractor using cement-based material that will provide a minimum of 3,000 psi compressive strength and sufficient bond to existing clean concrete surface – Ardex K-15. After completion of sanding, patching, and leveling, vacuum or sweep entire surface of concrete to remove loose dust and dirt before starting the installation of material.

3.2 INSTALLATION

A. Adhesion:
   1. Methods:
      a. Glue material to subfloor no sooner than 24 hours after the material has been laid in position.
      b. Use an acrylic type adhesive, applied with a fine tooth notched trowel, giving coverage of between 100 to 150 s.f. per gallon.
      c. Recommended Adhesives: W.W. Henry #234 or Chapco #314 or equal (as approved by the manufacturer). To maintain this rate of coverage, trowel blades need to be renewed frequently.
      d. Recommended trowel gage: 1/16" x 1/16" x 1/16" square notched. Throwawy blades are recommended to maintain proper notch size Use one blade for approximately 700 s.f. of floor area.
   2. Recommendations:
      a. Follow adhesive manufacturer's instructions after the material has been in place for 24 hours.
      b. Respect the open time of the adhesive, which will vary according to temperature, humidity, porosity, and absorption rate of the subfloor.
      c. Insufficient open time will cause bubbling. Too long an open time will result in poor adhesive transfer. NOTE: Do not install equipment or allow foot traffic on the floor for a minimum of 48 hours following installation to allow the adhesive to set properly (see manufacturer's instructions).

B. Installation of Sheets:
   1. Strike a chalk line across the center of the playing area. Be sure that the line is square to the room.
   2. Lay the first length of flooring along this chalk line and the work progressively outward, leaving a small gap between sheets to allow the material to relax.
   3. Material should be unrolled in place for 24 hours prior to adhesion.
   4. Starting from the center line and working outward, fold the sheets back halfway and apply the adhesive to the subfloor.
   5. Position the first half into the adhesive, then repeat this process with the second half.
   6. Continue laying sheets by butting the edges or overlapping and double cutting through both sheets using a straight edge.
   7. Rolling is done in two stages.
      a. Manually: Immediately after material is positioned onto the adhesive.
      b. Using a roller: Roll entire surface crossways using a 75-lb (minimum) flooring roller.
   8. Seaming of Joints (Heat Welding Method):
      a. Mechanical routing using an electric routing machine by Leister equipment Company or equal approved by manufacturer.
         1) Foam-Backed Sheet: Rout only through depth of wear layer.
         2) Non-Foam-Backed Sheet: Rout to 3/4 of total thickness.

b. Manual Seaming:
   1) This must be done with a heat welding gun with variable temperature control and a speed weld nozzle by Leister Equipment Company or equal approved by manufacturer.
   2) Nozzle size is 5mm.
   3) Avoid forcing welding rod into the seam to ensure a satisfactory finish.
   4) For all types of welding equipment, observe manufacturer's instructions, particularly with regard to speed of welding.
   5) Chalk both sides of the seam to avoid scorching and shining of the material during welding procedures.

c. Mechanical Welding (required in large areas): This is done using a Leister type automatic welding machine with a variable temperature hot air gun and multi-outlet nozzle. Set the pressure of the guide to avoid forcing the weld into the seam (see tool manufacturer's installation procedure).

d. Finishing: Trimming is done in two stages once the welding rod and material have cooled.
   1) First, trim using a cable slide.
   2) Second, trim fluch with the floor using a spatula or hook-billed knife.
   3) After the welding rod is trimmed smooth or flush with the top surface, check the entire seam to ensure that the welding cord is bonded properly and is flush with the top wear layer.

C. Game Lines and Logos
   1. Lay out game lines using tape and taping machine approved by flooring manufacturer.
   2. Mix line paint according to supplier's instructions.
   3. Apply game line paint with roller, and allow to dry before removing tape.
   4. Line painting and colors shall be in accordance with Architect's drawings and supplier's directions

3.3 CLEANING

A. Clean up all unused materials and debris and remove from the premises. Dispose of empty containers in accordance with federal and local regulations.

B. Clean flooring using methods recommended by manufacturer.

3.4 PROTECTION

A. Protect the surface from damage by other trades until acceptance by Architect.

B. No smoking, open flames, nor sparks from electrical equipment or any other source shall be permitted during the installation process, or in areas where materials are stored.

C. If it becomes necessary to move any heavy fixtures or appliances over the flooring on casters or dollies, the flooring should be protected with 1/4" or thicker plywood, hardboard or other underlayment panels. If other on-site work is continuing, use a protective covering such as plain, undyed kraft paper to guard against damage to the new floor.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Carpet tile, including the following:
   1. Surface preparation.
   2. Accessories, including edge strips.

B. Related Sections:
   1. Section 09 65 00 - Resilient Flooring: rubber base.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
   1. Provide manufacturer's installation instructions, including manufacturer's approved adhesive to be used for installation of carpet tile.
   2. Provide certification of manufacturer's approval of adhesive.

B. Product data for each type of carpet material and accessory required. Products proposed must meet or exceed the specifications identified in this section. Submit manufacturer's technical specifications, published standard warranty, attached comparative checklist, and the following manufacturer's test reports:
   1. Methenamine Pill Test (DOC FF #1-70), Rating Pass.
   2. Flooring Radiant Panel Test, NFPA-253, ASTM E 648.
   3. Smoke Density, NBS Smoke Density Chamber NFPA-258, 450 or less.
   4. Static Test, AATCC Test Method 134-1979, 2.5KV or below under standard test conditions 70°F., 20% R.H.

C. Samples for verification purposes in manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Prepare samples from material to be used for the work. Submit the following:
   1. 12" square samples of each type of carpet material required.
   2. 12" long samples of each type of exposed edge striping and accessory item.

D. Maintenance Manual: Provide 2 copies of a printed maintenance manual, written by the carpet manufacturer's Technical Service Department delivered to the Owner at the project site. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer’s recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

E. Concrete Slab Testing
   1. Alkalinity and Adhesion Testing:
      a. Submit result of pH tests.
      b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
      c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
      d. Proceed with installation only after substrates pass testing.
   2. Relative Humidity Probe Tests:
      a. Submit results for in situ relative humidity probe tests.
      b. Submit date and time measurements were made.
      c. Submit locations and depth of probe holes.
      d. Submit temperature and relative humidity in each probe hole.
      e. Submit ambient air temperature.
      f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
      g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.

3. Anhydrous Calcium Chloride Testing
   a. Submit time and date of placement and retrieval.
   b. Submit ambient air temperature and humidity during test duration
   c. Submit manufacturer's instructions and relative technical data.
   d. Acceptable moisture emission rates are typically 3 Ibs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
   e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty**.**

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in carpet manufacturing with 5 years minimum experience.

B. Installer Qualifications: An experienced installer with 3 years minimum documented experience in carpeting installations of similar scope.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Carpet tile shall be delivered to the project site in manufacturer's standard boxes. Each box shall have register number permanently attached to box.

B. Store materials for 3 days prior to installation in the areas of installation to achieve temperature stability.

1.5 SITE CONDITIONS

A. Measurements: Dimensions supplied on the drawings are approximate. Contractor shall carefully check all dimensions and other conditions affecting his work in the field and shall be responsible for proper installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Temperature and Humidity: Carpet must be installed when the indoor temperature is between 65°F. and 95°F. with a maximum relative humidity of 65%. If ambient temperatures are outside these parameters, the installation must not begin until the HVAC system is operational and these conditions are maintained at least 48 hours before, during, and 72 hours after completion.

B. Provide sufficient lighting.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.

B. Include maintenance procedures, recommended maintenance materials and suggested schedule for cleaning and shampooing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carpet Tile (17B): Provide 19.69" x 19.69", Honor Roll, "Cubic" carpet tiles as manufactured by Interface Color as scheduled in SECTION 09 99 00 – COLOR SCHEDULE.
   1. Construction: Tufted Textured Loop.
   2. Yarn Weight: 18 oz. per sq. yard minimum.
   3. Gauge: 1/12 minimum.
   4. Density: 6,968 oz./cubic yd. minimum (per ASTM D-5848).
   5. Face Yarn: 100% branded nylon, Type 6 or Type 6,6. 100% Bulk Continuous Filament (BCF)
   6. Stain Resistance: AATCC-175, must pass Acid Red 40 spot test with an 8 or better.
   7. Dye System: Solution dyed.
   8. Backing: 100% thermoplastic composite (no latex or urethanes). Backing system must provide a 100% moisture barrier.

9. Appearance Retention; one of the following:
   a. ASTM D-7330 Method for Assessment of Surface Appearance Change in Pile Yarn Floor Coverings (Hexapod Test): Minimum 3.0 rating for heavy traffic.
   b. ASTM D5417 Vetterman Drum Test for 22,000 cycles. A minimum rating of 3.0 using CRI TM-101 Reference Scale.

B. Substrate Filler: As recommended by adhesive and carpet tile manufacturer; compatible with substrate.

C. Substrate Primer and Sealer: Type as recommended by carpet tile manufacturer.

D. Adhesive: As recommended by the carpet tile manufacturer.

E. Edge Strips: Provide two-piece vinyl, 1/4" leg, Joining Moulding, No. 940 'T' with No. 970 Track, and provide No. 356 'T', where 1/2" leg is required, as manufactured by BurkeMercer Products (phone 800.669.7010 web site: www.burkflooring.com). Color(s) as selected by Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before commencement of any work the Contractor shall inspect the floors to receive carpet tile to determine the condition of those surfaces, and shall furnish and apply suitable primer and otherwise prepare floor surfaces in accordance with the carpet tile manufacturer's instruction.

3.2 PREPARATION

A. Testing of concrete slabs
   1. Anhydrous Calcium Chloride Testing
      a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.
      b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
      c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
      d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.
         1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
         2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
         3) Unseal dish and expose test according to preprinted test kit instructions.
         4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
         5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.
      e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.
   2. In Situ Relative Humidity Probe Test:
      a. Conduct in situ relative humidity probe testing per ASTM F2170.
      b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
      c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
      d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.

e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
i. Proceed with installation only after substrates pass testing.
j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.

3. Alkalinity and Adhesion Testing
   a. Conduct pH test per ASTM F710.
   b. Test for alkalinity prior to installation of flooring materials.
   c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
   d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
   e. Proceed with installation only after substrates pass testing.
   f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty**.**

B. Delay installation until all surrounding work, including painting, has been completed. Vacuum substrate immediately prior to carpet tile installation, and remove all deleterious substances which would interfere with installation or be harmful to the work.

C. Ensure floors are level, with maximum surface variation of 1/4 inch in 10 feet non-cumulative. Inspect subflooring for cracks, holes, abrasions, rough spots, ridges, or other conditions which will adversely affect execution and quality of work.

D. Ensure concrete floors are free from scaling and irregularities and exhibit neutrality relative to acidity and alkalinity.

E. Use an approved cementitious filler to patch cracks, small holes and for leveling.

F. Notify Architect in writing of any condition which will prevent satisfactory completion of work. Do not proceed until such defects are entirely corrected. Application or installation of carpet tile shall constitute acceptance of sub-floors.

3.3 INSTALLATION

A. General: Comply with CRI Carpet Installation Standard 2011, “Modular Carpet.” (Tiles)

B. Lay carpet tile on floors in non-directional pattern**.**

C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

D. Extend carpet tile under open-bottomed and raised-bottom obstructions, and under removable flanges of obstructions. Extend carpet tile into closets and alcoves of rooms indicated to be carpeted, unless another floor finish is indicated for such spaces. Extend carpet tile under all movable furniture and equipment.

E. Vacuum clean substrate. Spread adhesive in quantity recommended by manufacturer after primer application to ensure proper adhesion over full area of installation. Apply only enough adhesive to permit proper adhesion of carpet tile before initial set.

3.4 CLEANING

A. Remove excess adhesive from floor, base and wall surfaces without damage.

B. Clean and vacuum carpet tile surfaces.

3.5 PROTECTION

A. Prohibit traffic from carpet tile areas for 24 hours after installation.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 84 13

FIXED SOUND-ABSORPTIVE/SOUND-REFLECTIVE PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustical wall panel system.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Submit proposed layout of coverage by acoustical panels, details of proposed mounting method.

C. Samples: Submit a minimum size of 12" x 12" sample of each proposed panel, to include specified facing, proposed edge detailing and a mounting element.

D. Certification: Submit manufacturer's certificates of flame spread rating of selected fabric facings or products, and independent laboratory tests of sound absorption coefficients for products in thickness specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acoustical Wall Panels (24A): Provide acoustical wall panels as manufactured by Tectum, Inc., 105 South Sixth Street, Newark, OH 43055; Telephone: (888) 977-9691, (740) 345-9691; website: www.tectum.com.

B. Quality: Tectum Standard Interior Acoustical Wall Panels.
1. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
2. Thickness: 1½ inches.
3. Edge: Long edge beveled
4. Width and Length as shown on drawings.
5. Color: Provide colors as scheduled in SECTION 09 99 00 - COLOR SCHEDULE.
6. Mounting Style: “D-20”. Provide all fasteners, and furring strips, where shown, for a complete single source installation.
7. Flammability (ASTM E 84): Flame Spread 25 or less.
8. Hardware: Manufacturer's standard concealed mounting hardware consisting of panel, wall and fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls for conditions that would prevent proper installation of acoustical products, and report such conditions to the Architect for correction.

B. Do not proceed until defective conditions are corrected.

3.2 INSTALLATION

A. Securely install acoustical panels aligned plumb and square, with uniform, tight butt joints between adjacent panels, in accordance with manufacturer's written directions.

B. Contractor shall remove packing material, construction debris, tools and equipment from site upon completion of work, leaving each installation clean and acceptable for use and occupancy by Owner.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: On-the-job painting and finishing of exterior and interior surfaces.
   1. Included: Paint and finish the following materials, fittings, and equipment items which are exposed-to-view.
      a. Iron, steel, and galvanized metal.
      b. Wood.
      c. Concrete masonry units.
      d. Interior concrete ceiling and beam surfaces.
      e. Gypsum board.
      f. Interior caulked joints.
      g. Portland cement plaster.
      h. Bare and insulation covered piping and ductwork, conduit, hangers, grilles and registers, and primed metal surfaces and factory-finished surfaces of mechanical and electrical equipment.
   2. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels, including the following:
      a. Factory-finished metal lockers and finished light fixtures.
      b. Architectural aluminum and stainless steel.
      c. Interior concrete floors and steps and all exterior concrete.
      d. Acoustic panel ceilings, unless noted on drawings.
      e. Pre-finished cabinets.
      f. Operating parts: Moving parts of operating mechanical and electrical equipment, such as: valve and damper operators, linkages, sensing devices, motor and fan shafts
      g. Labels: UL, FM, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
   3. Contractor shall examine the drawings for mechanical and electrical work, and all materials installed throughout the building which require painting shall be painted under this section of the specifications.

B. Related Sections:
   1. Section 05 12 00 - Structural Steel Framing: shop priming of structural steel.
   2. Section 05 21 00 - Steel Joists Framing: shop priming of steel joists.
   3. Section 05 50 00 - Metal Fabrications: shop priming of metal fabrications.
   4. Section 09 99 00 - Color Schedule**.**

1.2 SYSTEM DESCRIPTION

A. For purposes of this painting specification, the following areas and spaces are not considered finished, occupied areas and there will be no painting therein except for doors and frames and as may be specifically scheduled in article paint schedule.
   1. Mechanical chases.
   2. Spaces above suspended ceilings.

1.3 SUBMITTALS

A. Samples:
   1. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
   2. Submit two 8-1/2" x 11" samples of each paint color scheduled on the color schedule prepared by the Architect. Samples shall be on heavy cardboard and shall be made with the actual mixed paints to be used on the project.
   3. Samples for Initial Selection of each type of texture finish product.

B. Paint Schedule: If painting materials other than those specified are proposed for use, submit a complete schedule of the materials to be substituted. This schedule, in triplicate, shall be in the same form as the paint schedule included in this section, and shall list materials by manufacturer, brand name, and type for each surface to be finished.

C. Federal law requires renovation firms (including sole proprietorships) to be certified and requires individuals to be trained in the use of lead-safe work practices. Contractors who perform renovation, repairs, and painting jobs shall:
   1. Provide a copy of your EPA lead training certificate.
   2. Show what lead-safe methods you will use to perform the job.
   3. Provide references from at least three recent jobs involving projects before 1978.
   4. Keep records to demonstrate that you and your workers have been trained in lead-safe work practices and that you follow lead-safe work practices on the job.

D. Close-out Schedule: Upon completion of work, furnish a full schedule of paint types, brand names, location of purchase, color numbers actually used and formulas for each to the Owner. Provide paint card forms showing:
   Product name and quality:
   Project and area:
   Manufacturer's stock number and date of manufacturer:
   Content by volume, formula for pigment and vehicle constitutes:
   Mixed by (company):
   Color and name:
   Provide all information with transmittal upon submission of extra materials at the end of the job.

1.4 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with 3 years' experience.

B. Applicator: Company specializing in commercial painting and finishing with 2 years' experience.

C. Product Labels: Include manufacturer's name, type of paint, stock number, color and label analysis on label of containers.

D. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as final coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

E. V.O.C. (Volatile Organic Compound) Compliance: Products listed in the schedules and/or substitutes proposed for use by Contractor must be formulated to meet all applicable ordinances and regulations regarding maximum V.O.C. content. Utilize products which have been specially formulated to meet such requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in original containers with seals unbroken and labels intact.

B. Storage: Contractor shall designate a specific space at the project site for storing and mixing materials. Protect this space and repair all damage resulting from use. Do not store kerosene nor gasoline in this space. Remove oily rags at the end of each day's work.

1.6 PROJECT CONDITIONS

A. Environmental Requirements: Maintain the temperature inside the building at not less than 60°F. during painting and finishing.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 65°F. for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

C. Minimum application temperatures for latex paints: 45°F. for interiors; 50°F. for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum application temperature for varnish and finishes: 65°F. for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft.-candles measured mid-height at substrate surface.

F. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified during application and drying periods of 24 hours between coats and 72 hours after final coat.

G. Protection: Provide sufficient drop cloths to fully protect adjacent finished work.

1.7 PRECAUTIONS

A. Do not store paints, oils, thinners and other flammable items inside the building. They shall be stored in approved containers when not in actual use during the painting job. The fire hazard shall be kept at a minimum.

B. Take precautions to protect the public and construction workers during the progress of the work.

C. Furnish a temporary fire extinguisher of suitable chemicals and capacity, located near flammable materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide paint as manufactured by one of the following:
Kelly-Moore Paint Co. (http://www.kellymoore.com)
PPG Paints (http://www.ppgpaints.com)
The Sherwin-Williams Co. (http://www.sherwin.com/default.asp)

B. Materials described are based on the specifications of the above listed manufacturers, and are given to designate the quality of materials required. Materials of best quality grade are representative of the standard of quality required. Materials not displaying manufacturer's identification as a first line, best-grade product will not be acceptable.

C. Colors: The Architect has prepared a color schedule; reference SECTION 09 99 00 - COLOR SCHEDULE. Regardless of which brand of paint is selected for use the Contractor shall intermix and blend as required to obtain an exact match to each color on the color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report to Architect any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum wallboard: 12 percent.
2. Interior located wood: 15 percent, measured in accordance with ASTM D 4442.
3. Concrete: 12 percent.
4. Masonry: 12 percent.
5. Plaster: 12 percent

D. Test shop-applied primers for compatibility with subsequent cover materials.

E. Perform the following Test procedure prior to painting. This will determine if Passivators exist on galvanized metal. This procedure is not necessary on galvanized metal with G 90 Paint Grip.
1. Prepare a solution by dissolving 20 grams of copper sulfate in one liter (1000 grams) of water. Copper sulfate crystals may be purchased at most drug stores.
2. Solvent wash a small area per the procedure of SSPC-SP1.
3. Sand a small washed area using emery cloth.

4. Using a cotton swab saturated with the copper sulfate solution, apply a swipe to both sanded and unsanded washed areas.
5. If the sanded and unsanded surfaces turn black at the same time and that time is less than 10 seconds, there is no passivation on the surface other than light oil, and a normal degreasing/cleaning operation is sufficient preparation prior to the coating application. If the unsanded surface turns slower than the sanded surface, or not at all, a passivator of some type is present on the surface. If neither surface turns, the surface is probably an alloy of zinc or some other metal.
6. If the galvanized steel has been treated or passivated, the treatment or passivator must be removed by brush blasting. If this method is prohibited by environmental regulations, then chemical etching with Amchem's GALVAPREP SG-3 will be acceptable, if previously approved by the Architect. The chemical etching manufacturer's procedures should be followed carefully.
7. If the surface is determined to be an alloy by this test procedure, notify Architect and adhesion tests of the proposed coating applied over the proposed surface preparation must be conducted.
8. If no passivators are present, wash galvanized metal surfaces with mineral spirits to remove residual grease and oil.

F. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION

A. Perform preparation and cleaning procedures in accordance with coating manufacturer's instructions for each substrate condition.

B. Fill open joints, cracks and crevices on steel buck frames with metal putty and sand smooth before painting.

C. Sand woodwork surfaces smooth before priming.

D. Coat pine knots and pitch streaks with shellac before painting.

E. Putty nail holes after the prime coat.

F. Remove hardware and accessories, plates, lighting fixtures and similar items which are not to be finish-painted or provide adequate surface-applied protection for these items in place.

G. Uncoated steel and iron surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

H. Shop primed steel surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3.3 APPLICATION

A. Workmanship shall be of the highest quality. Mix and use paint materials in accord with the manufacturer's directions. Spread materials evenly, flow smoothly, and brush out without sags or runs.

B. Provide finish coats which are compatible with primer paints used. Provide barrier coats over incompatible primers where required.

C. When undercoats, stains or other conditions show through final paint coat, apply additional coats until paint film is of uniform color and sheen.

D. Finish the insides of wood cabinets, including backs of cabinet doors, as scheduled for the fronts and ends.

E. Between coats, sand enamel and lacquer finish on wood and metal surfaces to produce a smooth, even finish. Use #220 grit sandpaper or finer.

F. Tint priming coats and undercoats to approximate shade of final coat to assure uniformity of color in the finish. Touch up suction spots and "hot spots" before applying the last coat to produce an even result in the finish coat.

G. Exposed ductwork, piping and conduit in finished, occupied areas shall be painted the same color as the wall or ceiling against which it is installed, unless otherwise noted.

H. Apply the finish coat on gypsum board, plaster, and concrete surfaces with rollers.

I. On concrete masonry unit wall surfaces without a block filler, apply the first coat of paint with a spray gun.

3.4 TOUCH UP AND CLEAN

A. Touching Up: On completion, carefully touch up all holidays, marred and damaged spots, and work over all surfaces that have been repaired by other trades.

B. Cleaning: Remove spilled, splashed, and splattered paint from all surfaces. Do not mar surface finish of item being cleaned.

C. Reinstall the items removed under the provisions of paragraph above.

3.5 RE-PAINTING

A. Locations and Extent: The re-painting of existing surfaces shall be as follows:
   1. Painted wall, door and frame surfaces which have been reworked, cut into or patched, whether specifically designated on the drawings or not. Re-painting shall include all openings in existing walls.
   2. Entire rooms/areas, as designated on the drawings.

B. Colors: Match existing colors of corresponding surfaces except where new colors are scheduled.

C. Preparation:
   1. Clean surfaces to remove dust and dirt. Remove oil, grease, wax, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers and other contaminants which would inhibit paint bonding to the old paint.
   2. Remove rust and loose and flaking paint by scraping and sanding.
   3. Glossy surfaces of old paint films and ceiling grid must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or wash thoroughly and dull by sanding.
   4. Spot prime any bare areas with an appropriate primer in conformance with the following paint schedule for new work.
   5. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 Sq.Ft. Allow to dry one week before testing adhesion per ASTM D 3359. If the coating system is incompatible, complete removal of existing finish is required.

D. Painting: Generally, apply one coat of finish paint over old surfaces, using the same materials scheduled in the paint schedule for like new surfaces.

E. Verification: Verify the extent of re-painting work at the building and make due allowance for cutting and patching required for installation of mechanical and electrical work.

3.6 PAINT SCHEDULE

A. The products listed below represent top of the line products of each manufacturer. These products are not presented as being equivalent, as there are too many variables to match each product across the board. Manufacturer's designations are:
   KM Kelly-Moore Paint Co.
   PPG Pittsburgh Paints
   SW The Sherwin-Williams Co.

B. Interior Metal
1. Steel door frames, borrowed light frames, louvers and vision panel frames in doors, hollow metal doors, and interior ladders.
1 primer coat
KM 1710--Kel-Guard Zinc Chromate Red Oxide Primer
PPG Red Inhibitive Steel Primer, 6-208
SW Kromik Metal Primer E41N1
2 finish coats
KM 1630--Kel-Cote Alkyd Semi Gloss Enamel
PPG Speedhide 6-1110
SW ProMar 200 Alkyd Semi-Gloss Enamel, Series B34 W 200
2. Grilles, diffusers and registers in walls and ceilings.
1 finish coat
KM 1620--Kel-Cote Alkyd Eggshell Enamel
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
3. Other exposed iron and steel.
1 primer coat
KM 1711--Kel-Guard White Rust-Inhibitive Primer
PPG Speedhide Inhibitive Steel Primer, 6-208
SW Kem Kromik Metal Primer, B50 W 1
1 finish coat
KM 1620--Kel-Cote Alkyd Eggshell Enamel
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
4. Metal ductwork, hangers, supports and brackets.
1 primer coat
KM 1722--Kel-Guard Galvanized Iron Primer
PPG Speedhide White Galvanized Steel Primer, 6-209
SW Galvite Paint, B50 WZ30
1 finish coat
KM 1620--Kel-Cote Alkyd Eggshell Enamel
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
5. Items of mechanical and electrical machinery and equipment.
1 finish coat
KM 1700--Kel-Guard Rust Inhibitive Enamel
PPG Int/Ext Industrial Gloss Alkyd, 7-282 Series
SW Industrial Enamel, Series B54

C. Interior Masonry (At sound absorbing concrete masonry unit blocks, do not paint fibrous fillers)
1. Concrete masonry unit walls.
1 filler coat
KM 521--Acrylic Block Filler
PPG Pitt-Glaze Int/Ext Latex Block Filler 16-90
SW Heavy Duty Block Filler, B42 W 46
2 finish coats
KM 1650--Acry-Plex Latex Semi-Gloss Enamel
PPG Speedhide Interior Acrylic Latex Semi-Gloss Enamel, 6-510 Series
SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

D. Gypsum Wallboard
1. Gypsum board ceilings and furr downs.
1 texture coat
USG Multi-Purpose Texture - Sprayed Splatter - Light Finish Texture
PPG Speedhide Acrylic Texture Coating 4-50
3 finish coats
KM 550--Super Latex Flat Wall Paint
PPG Speedhide Interior Flat Latex 6-70 Series
SW ProMar 200 Latex Flat Wall Paint, Series B30 W 200

2. Gypsum board walls above ceramic tile wainscot.
    1 texture coat
        USG Multi-Purpose Texture - sprayed splatter medium-light finish texture
        PPG Speedhide Acrylic Texture Coating 4-50
    3 finish coats
        KM A1610 Acry-Plex 100% Acrylic Interior Eggshell Enamel
        PPG Speedhide Interior Enamel Eggshell Latex 6-411 Series
        SW ProMar 200 Interior Latex Eg-Shel B20W2200 Series
3. All other gypsum board walls.
    1 texture coat
        USG Multi-Purpose Texture - sprayed splatter medium-light finish texture
        PPG Speedhide Acrylic Texture Coating 4-50
    1 primer coat
        SW PrepRite 200 Latex Wall Primer B28W200 or approved equivalent
    2 finish coats
        KM 1650--Acry-Plex Latex Semi-Gloss Enamel
        PPG Speedhide Interior Semi-Gloss Latex Enamel 6-510 Series
        SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

E. Interior Caulked Joints
1. Caulking
    2 finish coats
        KM 1650--Acry-Plex Latex Semi-Gloss Enamel
        PPG Speedhide Interior Semi-Gloss Latex Enamel 6-510 Series
        SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

F. Exterior Metal
1. Steel door frames and hollow metal doors.
    1 primer coat
        KM 1710--Kel-Guard Zinc Chromate Red Oxide Primer
        PPG Speedhide Int/Ext Rust Inhibitive Steel Primer 6-208 Series
        SW Kromik Metal Primer E41N1
    2 finish coats
        KM 1700--Kel-Guard Rust Inhibitive Enamel
        PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
        SW Industrial Enamel, Series B54
2. Steel pipe, conduit, hangers supports and brackets.
    1 primer coat
        KM 1722--Kel-Guard Galvanized Iron Primer
        PPG Speedhide Int/Ext Galvanized Steel Primer 6-209
        SW Galvite Paint, B50 WZ30
    1 finish coat
        KM 1700--Kel-Guard Rust Inhibitive Enamel
        PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
        SW Industrial Enamel, Series B54
3. Galvanized steel pipe handrails, railings, lintels, ladders, ductwork, flashings, roof hatches, galvanized gutters and downspouts, scuppers, and ventilators. (Reference test procedure for Passivators)
    1 primer coat
        KM 1722--Kel-Guard Galvanized Iron Primer
        PPG Speedhide Int/Ext Galvanized Steel Primer 6-209
        SW Galvite Paint, B50 WZ30
    2 finish coats
        KM 1700--Kel-Guard Rust Inhibitive Enamel
        PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
        SW Industrial Enamel, Series B54
4. Items of mechanical and electrical machinery and equipment, including mechanical and electrical equipment on the roof which are 12" above roof line and are not concealed by a screen.
    1 finish coat
        KM 1700--Kel-Guard Rust Inhibitive Enamel
        PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
        SW Industrial Enamel, Series B54

G. Exterior Plaster
   1. Cement plaster surfaces with integral color.
      1 finish coat
         KM 1105 Kel-Crete Acrylic Masonry Finish
         PPG Speedhide Exterior Flat Acrylic Latex 6-610 Series
         SW A-100 Exterior Flat, A6-100 Series

H. Exterior Concrete
   1. Concrete Panels
      1 primer coat:
         SW Loxon Exterior Acrylic Masonry Primer, A24W89300 (8 mils wet, 3.2 dry)
      2 finish coats
         SW A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)

END OF SECTION

SECTION 09 99 00

COLOR SCHEDULE

THE COLOR SCHEDULE IS ISSUED AS A REFERENCE FOR COLOR SELECTIONS ONLY. THE COLOR SCHEDULE SHALL NOT TAKE PRECEDENCE OVER THE INDIVIDUAL SPECIFICATION SECTIONS. IF THERE IS A DISCREPANCY BETWEEN SPECIFICATION FINISHES AND COLOR SCHEDULE, NOTIFY ARCHITECT PRIOR TO ORDERING MATERIAL.

PROJECT NAME - **BRYSON ELEMENTARY SCHOOL**
EAGLE MOUNTAIN - SAGINAW I.S.D.

PROJECT NO. 1857.00
DATE 11-Jan-2019
REVISED 11-Jan-2019

MARK	COLOR KEY	ITEM	SPEC. SECTION	MANUFACTURER/ DESCRIPTION	REMARKS
1A	1A	SEALED MONOLITHIC CONCRETE	03 30 00	AS SPECIFIED	
3B	3B	2" X 2" CERAMIC MOSAICS	09 30 13	MFG: Daltile STYLE: Keystones COLOR: Suede Gray D182	RESTROOM FLOOR TILE, G2 GROUT
3E	3E- 1	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-001-W FINISH: Satin	TYPICAL FIELD WALL TILE, G1 GROUT
	3E- 2	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-016-W FINISH: Satin	LIGHT RED ACCENT WALL TILE, G1 GROUT
	3E- 3	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-017-W FINISH: Satin	RED ACCENT WALL TILE, G1 GROUT
	3E- 4	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-018-W FINISH: Satin	DARK RED ACCENT WALL TILE, G1 GROUT
	3E- 5	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-031-W FINISH: Satin	LIGHT BLUE ACCENT WALL TILE, G1 GROUT
	3E- 6	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-033-W FINISH: Satin	BLUE ACCENT WALL TILE, G1 GROUT
	3E- 7	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Pantheon STYLE: Hue COLOR: 100-035-W FINISH: Satin	DARK BLUE ACCENT WALL TILE, G1 GROUT
	3E- 8	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Interceramic STYLE: Retro A COLOR: Almond FINISH: Matte	CORRIDOR FIELD TILE, G3 GROUT

MARK	COLOR KEY	ITEM	SPEC. SECTION	MANUFACTURER/ DESCRIPTION	REMARKS
	3E- 9	8" X 8" GLAZED CERAMIC TILE	09 30 13	MFG: Interceramic STYLE: Retro B COLOR: Midnight Blue FINISH: Matte	CORRIDOR ACCENT TILE, G3 GROUT
	G1	GROUT	09 30 13	CUSTOM BLDG PROD COLOR: #381 Bright White	
	G2	GROUT	09 30 13	CUSTOM BLDG PROD COLOR: #19 Pewter	
	G3	GROUT	09 30 13	MATCH EXISTING	EXISTING CORRIDOR GROUT
	G4	GROUT	09 30 13	MATCH EXISTING	EXTERIOR BRICK GROUT
4A	4A	BRICK VENEER	04 20 00	AS SPECIFIED	
4C	4C	CAST STONE	04 72 00	TO BE SELECTED BY ARCHITECT	
6A	6A	CONCRETE MASONRY UNITS - PAINT	04 20 00 or 04 22 00	AS SPECIFIED	
6EP	6EP	CONCRETE MASONRY UNITS - EPOXY PAINT	04 20 00	AS SPECIFIED	
14B	14B-1	RUBBER BASE - COVED	09 65 00	MFG: Roppe STYLE: Pinnacle COLOR: 123 Charcoal	TYPICAL GYM WALL BASE
	14B-2	RUBBER BASE - COVED	09 65 00	MATCH EXISTING	EXISTING CORRIDOR & KITCHEN WALL BASE
14E	14E	ATHLETIC SHEET FLOORING	09 65 66	MFG: Gerflor STYLE: Taraflex Sport M Plus COLOR: 6375 Oak Design	
15A	15A-1	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 51858 Sandrift White	TYPICAL FIELD VCT
	15A-2	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 51804 Earthstone Greige	ACCENT VCT
	15A-3	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 51880 Maraschino	ACCENT VCT
	15A-4	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 51812 Lemon Yellow	ACCENT VCT
	15A-5	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 57517 Bodacious Blue	ACCENT VCT
	15A-6	VINYL COMPOSITION TILE	09 65 00	MFG: Armstrong STYLE: Standard Excelon Imperial Texture COLOR: 59230 Victoria Blue	ACCENT VCT

MARK	COLOR KEY	ITEM	SPEC. SECTION	MANUFACTURER/ DESCRIPTION	REMARKS
17B	17B	20" X 20" CARPET TILE	09 68 13	MFG: Interface STYLE: Cubic COLOR: 6395 Construction	TYPICAL CARPET
20A	P-1	GYPSUM WALLBOARD - PAINT	09 21 16	AS SPECIFIED	
21ES	P-1	EXPOSED STRUCTURE - PAINT	09 91 00	AS SPECIFIED	
21FP	21FP	EXPOSED STRUCTURE - CEMENTITIOUS FIREPROOFING	07 81 16	AS SPECIFIED	
22A	22A	2' X 2' ACOUSTIC LAY-IN PANELS	09 51 00	AS SPECIFIED	
22B	22B	2' X 2' VINYL COATED LAY-IN PANELS	09 51 00	AS SPECIFIED	CEILING TILES IN KITCHEN
24A	24A-1	TECTUM WALL PANELS	09 84 13	MFG: ARMSTRONG STYLE: TECTUM Direct-Attach COLOR: Paint P-4	
	24A-2	TECTUM WALL PANELS	09 84 13	MFG: ARMSTRONG STYLE: TECTUM Direct-Attach COLOR: Paint P-5	
	24A-3	TECTUM WALL PANELS	09 84 13	MFG: ARMSTRONG STYLE: TECTUM Direct-Attach COLOR: Paint P-6	
		INTERIOR PAINT			
	P-1	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW7757 High Reflective White	TYPICAL GYM PAINT & METAL DECK PAINT
	P-2	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW6385 Dover White	CORRIDOR PAINT
	P-3	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW6803 Danube	PAINT STRUCTURE ONLY
	P-4	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW7073 Network Grey	24A-1 PAINT
	P-5	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW7074 Software	24A-2 PAINT
	P-6	INTERIOR PAINT	09 91 00	MFG: Sherwin Williams COLOR: SW7075 Web Gray	24A-3 PAINT
		EXTERIOR PAINT			
	P-5	EXTERIOR PAINT	09 91 00	MFG: SHERWIN WILLIAMS COLOR: MATCH EXISTING	
		PLASTIC LAMINATE			
	PL-1	PLASTIC LAMINATE-FACED WOOD DOORS	08 14 23	MATCH EXISTING	
		MISCELLANEOUS			
		PREFINISHED METAL COPING	07 62 00	AS SPECIFIED	
		EXPANSION JOINT ASSEMBLIES	07 95 13	TO BE SELECTED BY ARCHITECT	
		PREFINISHED STOREFRONT	08 41 13	AS SPECIFIED	
		EXTERIOR DOOR PULLS AND PUSH BARS	08 71 00	AS SPECIFIED	

MARK	COLOR KEY	ITEM	SPEC. SECTION	MANUFACTURER/ DESCRIPTION	REMARKS
		METAL CORNER TRIM & TILE TOP CAP	09 30 13	MFG: Schluter Systems STYLE: RONDEC FINISH: Satin anodized aluminum	Tile Outside Corner Trim & Top Cap
		METAL TRANSITION STRIP	09 30 13	MFG: Schluter Systems STYLE: RENO-U FINISH: Satin anodized aluminum	Porcelain To VCT
		GAMELINE COLORS	09 64 53	MFG: Taraflex COLOR: 085X Tennis	VOLLEYBALL COURT LINES
		GAMELINE COLORS	09 64 53	MFG: Taraflex COLOR: 085W Badminton	BASKETBALL COURT LINES
		INTERIOR ROOM IDENTIFICATION - SIGNS	10 14 00	TO BE SELECTED BY ARCHITECT	
		SOLID PHENOLIC TOILET COMPARTMENTS	10 21 15	TO BE SELECTED BY ARCHITECT	
		CORNER GUARDS	10 26 13	COLOR: MATCH ADJACENT PAINT COLOR	
		FIRE EXTINGUISHER CABINET	10 44 13	AS SPECIFIED	
		PREFABRICATED WALKWAY COVER	10 73 26	AS SPECIFIED	
		WALL PADS	11 66 00	TO BE SELECTED BY ARCHITECT	
		GYMNASIUM BACKBOARD PADDING	11 66 00	TO BE SELECTED BY ARCHITECT	
		SCOREBOARD - BASKETBALL	11 66 00	TO BE SELECTED BY ARCHITECT	
		HORIZONTAL BLINDS	12 21 13	COLOR: MATCH EXISTING	
		TELESCOPING BLEACHERS	12 66 13	TO BE SELECTED BY ARCHITECT	

1.01 COLOR SCHEDULE GENERAL NOTES

A. Finishes shall continue to inside corner, unless noted otherwise.

B. Sealants shall be color to match adjacent material - typical.

C. At ceilings with exposed structure, all exposed elements shall be painted the scheduled color, including mechanical

D. ductwork and electrical wiring and devices.
At painted CMU base, color shall match the wall above.

1.02 PAINT COLOR INFORMATION

A. **INTERIOR PAINT**

1, All interior sealants shall be painted to match adjacent wall

2, **HOLLOW METAL DOOR FRAMES:**

a. Door frames and vision panel frames shall be painted P-1, except as noted below:

i. Exterior doors: Paint exterior face of door frame to match P-7. Paint interior door frame to match P-1.

b. At doors frames with 2 different colors, transition color at inside corner of door stop, on the door side of the stop.

3, **GLAZED OPENING FINISH SCHEDULE**

a. Hollow metal glazed openings shall be painted P-1, except as noted below:

B. **EXTERIOR PAINT**

1, Steel plates and angles at masonry openings shall be painted to match the brick they are carrying

2, Exterior hollow metal doors and door frames shall be painted to match masonry or surface finish where it occurs

3, Electrical and mechanical devices mounted on the wall shall match the masonry or surface finish where it occurs

4, Bollards at dumpster enclosures shall be safety yellow

END OF SECTION

SECTION 10 14 00

IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cast aluminum letters and room identification signs.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Submit manufacturer's complete line of color samples, 1" x 3", for initial color selection.

C. Invoices: Submit certified copies of invoices indicating description and quantity of signs delivered and installed.

D. Template: Submit full-size template drawing for approval of aluminum letter size, stock, spacing, anchorage devices, etc.

1.3 PRE-INSTALLATION CONFERENCE

A. Pre-installation Meeting: Contractor shall schedule a pre-installation meeting at the project site with the Architect, Contractor and building letter installer for approval of template field layout prior to beginning of installation.

1.4 QUALITY ASSURANCE

A. Interior signs shall be provided by a single source with at least five years' experience successfully providing signs of similar type and scope.

B. Signs shall comply with the Texas Accessibility Standards (TAS) and other laws and ordinances of authorities having jurisdiction. Braille shall be Grade II, having dimensions as required to meet TAS.

1.5 PACKING, DELIVERY, AND STORAGE

A. Deliver components correctly packaged to prevent damage. Pack modules and back-up plates unassembled to allow for mechanical mounting of backplate to wall with concealed fasteners.

B. Individually and clearly identify each sign number, type, location to be installed, mounting instructions, and other pertinent information.

1.6 WARRANTY

A. Cast Aluminum Letters: Provide 5-year manufacturer's warranty.

PART 2 - PRODUCTS

2.1 CAST ALUMINUM LETTERS

A. Type: Custom fabricated letters and numbers specified herein. Letters to be cast aluminum with anodized finish.
   1. Sign to read: Reference exterior elevation drawing for letters, letter size, and font.

B. Material: Manufacturer's standard aluminum alloy for casting. Screws shall be stainless steel.

C. Fabrication:
   1. Letters shall be cast with smooth flat faces, sharp corners, true lines and accurate profiles.

2. Cast letters shall be free of pits, scale, and holes, or other defects and faces shall be mechanically finished to a satin texture.
3. Provide at least two points of attachment for each letter.

D. Pre-cleaning: Immerse the letters in hot alkaline cleaner to remove contamination.

E. Anodic Finish: Manufacturer's standard dark bronze anodic coating, 0.018 inch or thicker, over a satin (directionally textured) mechanical finish.

2.2 INTERIOR IDENTIFICATION GRAPHICS

A. "InTouch" photopolymer plaque signs as manufactured by ASI Sign Systems, Inc. (8181 Jetstar Drive, Suite 100, Irving, Texas, 75063) or approved equivalent.
1. Manufacture face panels utilizing an 1/8" integral photopolymer panel.
2. Face panel tactile and Grade 2 Braille graphics shall be raised a minimum of 1/32".
3. Treat the face panel to assure paint adhesion.
4. Colors to be selected by Architect to meet ADA requirements for contrast.
5. Characters and background of signs shall have eggshell, non-glare finish.
6. Sign edges shall be painted to match background.
7. Sign edges are to be smooth and free of saw marks and imperfections.
8. Sign design shall be as indicated on drawings.
9. Typeface shall be Helvetica Medium.
10. Lettering shall be computer generated, accurately reproducing the letterform.
11. Provide matching coverplate for signs mounted on glass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erecting Letters: Erect letters straight and level on the exterior face of building where shown.
1. Attached to face brick: Secure with threaded stud anchors set in non-staining, quick setting cement. Letters shall be flush mounted to masonry surfaces.
2. Attached to CMU wall: Secure letters to CMU wall with stainless steel threaded rods and non-staining, quick setting cement. Letters shall be flush mounted to masonry surfaces.
3. Bottom rail mounting on top of prefabricated aluminum canopy.
a. Attach continuous aluminum rail to top of aluminum canopy as indicated on the Drawings.
b. Drill and tap letters from the bottom, with stainless steel screws going through aluminum rails.
c. Provide a flattened base on letters with round bottoms (O, S, G, etc.) to receive studs.
d. Include tiebacks as recommended by letter fabricator.

B. Identification Graphics:
1. On hard surfaces (i.e. ceramic tile, masonry, or plastic laminate), install room identification signs plumb and square with the "Tuff-bond" silicone adhesive furnished by the manufacturer (foam tape is not allowed).
2. On painted gypsum wallboard or vinyl wallcovering, install room identification signs on backing plates with the "Tuff-bond" silicone adhesive furnished by the manufacturer (foam tape is not allowed).
a. The backing plate shall be 1/8" thick and shall be the same size as the face panel.
b. Screw the backing panel into molly bolts in the wall with two countersunk, flathead screws.
3. Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.
4. Unless noted otherwise, install signs on latch side of the door such that clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
5. Installation shall comply with ADA requirements.
6. For signs mounted on glass, install matching coverplate on opposite side of glass and aligned with the sign.
7. Install pressure sensitive vinyl letters plumb and square in strict compliance with manufacturer's instructions.

3.2 CLEANING

A. On completion, clean exposed surfaces and leave free of defects.

B. Do not use abrasives.

3.3 COORDINATION

A. Contractor shall coordinate the installation of the identifying devices with other trades involved in the project.

3.4 DAMAGE

A. An identifying device which is scratched or defaced will be rejected.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 21 15

SOLID PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Solid phenolic toilet compartments.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry: wood blocking for bracket attachments.
2. Section 10 28 00 - Toilet Accessories.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Include complete manufacturer's catalog cuts and data sheets of hardware, anchors, fasteners, and installation requirements.
2. Submit literature documenting that the partition door latch meets Texas Accessibility Standards (TAS) requirements.

C. Shop Drawings: Include drawings for fabrication and erection of toilet compartment assemblies which are not fully described in manufacturer's data.

D. Samples: Submit a sample, 6" by 6", of each finish and color selected (photographic reproductions of color are not acceptable).

1.3 SEQUENCING AND SCHEDULING

A. Coordinate work with placement of suspension members and anchorage devices. Supply rough-in data in sufficient time for concealed preparatory to be conducted.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide floor-mounted, overhead-braced toilet compartments. Product/manufacturer; one of the following:
Concord; Accurate Partitions Division, Kinkead Industries, Inc.
Embassy; Global Steel Products Corp.
Corinthian; Metpar Corp.

2.2 MATERIALS

A. Solid phenolic core with melamine facing on both sides, fused to substrate without visible glue line or seam. Provide units with eased edges and with minimum 3/4-inch thick doors and pilasters and minimum 1/2-inch thick panels and screens. Color as scheduled in SECTION 09 99 00 – COLOR SCHEDULE.

B. Pilaster Shoes: ASTM A 167, Type 302/304 stainless steel of one-piece construction, 3" high, finish to match hardware.

C. Headrails: Extruded, polished anodized aluminum in anti-grip profile.

2.3 FABRICATION

A. Fabricate flush compartment panels, pilasters, and doors to the layout indicated with the following minimum dimensions.
1. Where grab bars are indicated, provide a min. 32" wide (clear opening) door.

2. At other locations, standard compartments shall have a 24" wide in-swinging door, unless specifically detailed and dimensioned otherwise.
3. Doors and compartments panels 58" in length with a 12" clearance between floor and bottom of panels and doors. Pilasters shall be floor mounted, overhead braced, 82" high.

B. Hardware: Provide hardware and fittings for compartment system of chrome-plated cast non-ferrous metal alloy, chrome-plated brass, or polished stainless steel. Stirrup brackets only may be heat-treated extruded aluminum with bright anodized finish.
1. Hinges: Hinges: Full length extruded aluminum in bright dip anodized finish or 14 gauge stainless steel continuous piano hinge. Hinges shall be fastened with stainless steel screws.
2. Brackets: Heavy duty aluminum (6463-T5 alloy) full length continuous wall brackets.
3. Latches: Fully mortised concealed type with steel bolt and provision for emergency access and paddle handle on accessible stalls.
4. Strikes and Keepers: Wrap-around type with rubber bumper, mounted with through bolts.
5. Coat hooks with rubber bumpers for in-swinging doors.
6. Pulls: Provide pulls adjacent to the latch on both sides of the toilet partition door. Furnish with wall bumpers where required to prevent doors from striking wall.
7. Fasteners: Vandal proof (one-way) screws and sex bolts of chrome-plated brass or stainless steel for all exposed locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Check areas scheduled to receive partitions for correct dimensions, plumbness of walls, soundness of wall surfaces, location of built-in framing/anchorages/bracing, and other conditions that would affect proper installation of holding brackets and anchorage or suspension devices.

C. Verify spacing of plumbing fixtures to assure compatibility with installation of partitions.

3.2 INSTALLATION

A. Install compartments rigid, straight, plumb, and with horizontal lines level. Drilling, cutting, and fitting to room finish shall be concealed in the finished work. Clearance at vertical edges of doors shall be uniform from top to bottom, and doors shall be free of warp and wind. Provide clearances of not more than ½" between pilasters and panels, and not more than 1" between panels and walls.
1. Attach dividing compartments to the back wall with two heavy two-eared stirrup brackets, and at the front to the pilasters with two of the same type brackets. Use two one-eared brackets at corners. The use of U-type brackets is not acceptable.
2. Attach overhead braces to walls with heavy saddle-type brackets.
3. Attach pilasters to floor with ⅜" threaded studs, washers, lock nuts, expansion shields (minimum of 2" penetration into concrete), and pilaster brackets. Level, plumb, and tighten the installation with the leveling device. Conceal the floor anchorage and bases with pilaster shoe assembly having concealed snap-down action on a concealed hold-down clip. Exposed fasteners on shoe will not be permitted.
4. Provide a 12" clearance between floor and bottom of compartment panels and doors.

3.3 ADJUST AND CLEAN

A. Adjusting: Adjust hardware just prior to final acceptance. Doors shall operate freely.
1. For out-swinging doors, adjust hinges to hold doors closed.
2. For in-swinging doors, adjust hinges to hold doors open at 30°.

B. Cleaning: Remove protective masking and clean surfaces, leaving them free of soil and imperfections.

END OF SECTION

SECTION 10 22 39.13

FOLDING GLASS-PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sliding/folding aluminum and glass door system, including aluminum frame, threshold, panels, sliding/folding and locking hardware, weather stripping for sound, glass and glazing; designed to provide an opening glass wall, with sizes and configurations as shown on drawings and specified herein.

B. Related Sections:
   1. Section 08 71 00 - Door Hardware.

1.2 SUBMITTALS

A. Detail Drawings: Indicate dimensioning, direction of swing, configuration, swing panels, typical head jamb, side jambs and sill details, type of glazing material, and handle height.

B. Product Data: Manufacturer's literature including independently tested data listing performance criteria and Owner's Manual with installation instructions.

C. Contract Closeout Submittal: Submit Owner's Manual from manufacturer. Identify with project name, location and completion date, type and size of unit installed.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide complete, precision built, engineered, pre-fitted unit by a single source manufacturer with at least 15 years' experience in providing folding/sliding door systems for large openings in the North American market.
   1. The manufacturer must have a quality system registration to the ISO9001:2000 standard.

B. Performance Requirements: Provide from manufacturer that has independently tested typical units. Testing results to include air infiltration in accordance with ASTM E 283, water penetration in accordance with ASTM E 331/E 547, structural loading in accordance with ASTM E 330, and forced entry in accordance with AAMA 1303.5 and CAWM 300-96.

C. Thermal Performance U value: Unit to be simulated in accordance with NFRC 100, shown in manufacturer's latest published data for the specified product.

D. Installer Qualifications: Installer experienced in the installation of manufacturer's products or other similar products for large openings. Installer to provide reference list of at least 3 projects of similar scale and complexity successfully completed in the last 3 years.

1.4 WARRANTY

A. Provide manufacturer's standard warranty against defects in materials and workmanship.

B. Warranty Period: Ten years for rollers and for seal failure of insulated glass supplied. For all other components, two years from date of delivery by manufacturer. Unit shall be installed by manufacturer's certified trained installer.

1.5 SITE CONDITIONS, DELIVERY, STORAGE AND HANDLING

A. In addition to general delivery, storage and handling requirements specified in Section 01 6600, comply with the following:
   1. Deliver materials to job site in sealed, unopened cartons or crates. Protect units from damage. Store material under cover, protected from weather and construction activities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide Nanawall® SL45, Monumental Aluminum Framed Folding/Paired Panel System as supplied by NANA WALL SYSTEMS, INC., 707 Redwood Hwy, Mill Valley, California 94941, Toll Free: (800) 873-5673, Telephone: (415) 383-3148, Website: www.nanawall.com.

2.2 MATERIALS

A. Frame and Panels: From manufacturer's standard profiles, provide head track, side jambs, and panels with dimensions shown on drawings.
   1. Provide panels with horizontal mullion(s) at specified height(s) from the bottom of the panel.
   2. Provide standard bottom rail.
   3. Aluminum Extrusion: Extrusions with nominal thickness of .078" (2.0 mm). Alloy specified as AlMgSi0.5 with strength rated as 6063-T5 or F-22 (European standard). Anodized conforming to AAMA 611.
   4. Aluminum Finish: clear anodized.

B. Glass: All glass to comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201. Provide manufacturer's standard glass with dry glazing: 1/4" (6 mm) laminated.

C. Locking Hardware and Handles:
   1. Main entry panel: On the main entry panel for models with a swing panel, provide manufacturer's stainless steel lever handles in a brushed satin finish on the inside and outside. Provide lock core per SECTION 08 71 00 - DOOR HARDWARE, for a compatible lock set with lockable latch, multi-point locking with a dead bolt and rods at the top and bottom on primary panel only. Rods to be concealed and not edge mounted. Depression of handles withdraws latch. Lifting of handles engages rods and turn of key or thumb turn engages deadbolt and operates lock. If there is a secondary swing panel, provide two point locking with flat handles on inside only for the secondary swing panel.
   2. On all other pairs of folding panels, provide manufacturer's standard flat handles and concealed two point locking hardware operated by 180 degree turn of handle between each pair. Face applied flush bolt locking will not be allowed.
   3. Flat handle finish: stainless steel in a brushed satin finish.
   4. Provide handle height centered at 41 3/8" from bottom of panel.
   5. Aluminum locking rods with standard fiber glass reinforced polyamide end caps at top and bottom. Rods to have a stroke of 15/16".

D. Sliding/Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware with top and bottom tracks.
   1. For each pair of folding panels, provide cardanic, independently suspended, four wheeled coated with fiber glass reinforced polyamide upper running carriage and lower guide carriage.
   2. Provide manufacturer's stainless steel hinges. Provide stainless steel security hinge pins with set screws.
   3. Adjustment: Provide system capable of specified amount of adjustments without removing panels from tracks without needing to remove panels from tracks, 1/16" (1.5 mm) in width per hinge.

E. Other Components:
   1. Threshold: Provide clear anodized flush sill.
   2. Weather stripping: Provide manufacturer's standard double layer EPDM or brush seals with a two layer polyamide fin at both the inner and outer edge of door panels or on frame for sealing between panels and between panel and frame.
   3. Provide stainless steel screws for connecting frame components.

2.3 FABRICATION

A. Use extruded aluminum frame and panel profiles, corner connectors and hinges, sliding and folding hardware, locking hardware and handles, glass and glazing and weather stripping as specified herein to make a folding glass wall. Factory pre-assemble as is standard for manufacturer and ship with all components and installation instructions.

B. Sizes and Configurations: See drawings for selected custom dimensions within maximum frame sizes possible as indicated in manufacturer's literature. See drawings for selected number of panels and configuration.

PART 3 - EXECUTION

3.1 ERECTION

A. Because of the large dimensions involved and the weight and movement of the panels, verify the structural integrity of the header such that the deflection with the live and dead loads is limited to the lesser of L/720 of the span and 1/4". Structural support for lateral loads (both wind load and eccentric load when the panels are stacked open) must be provided.

B. Examine surfaces of openings and verify dimensions; verify rough openings are level, plumb, and square, with no unevenness, bowing, or bumps on floor.

C. Installation of units constitutes acceptance of existing conditions.

3.2 INSTALLATION

A. Install frame in accordance with manufacturer's recommendations and installation instructions. Properly flash and waterproof around the perimeter of the opening.

B. Installer to provide appropriate anchorage devices and to securely and rigidly fit frame in place, absolutely level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work.

C. Install panels, handles and lock set in accordance with manufacturer's recommendations and installation instructions.

D. If necessary, adjust hardware for proper operation.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 26 13

CORNER GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Corner guards.

B. Related Sections:
1. Section 04 20 00 - Unit Masonry: concrete masonry units.
2. Section 09 21 16 - Gypsum Board Assemblies: gypsum board walls.
3. Section 09 30 13 - Ceramic Tile.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 **WARRANTY**

A. **Provide manufacturer's limited lifetime warranty against material and manufacturing defects on stainless steel corner guards**

PART 2 - PRODUCTS

2.1 CORNER GUARDS

***** Kitchens*****

A. Cement-On Guards: Provide 4'-0" long Type 430, 18-gage stainless steel corner guards, 90°, 1/8" radius, 3½" wing as manufactured by Tubular Specialties Mfg. (800.472.2227,www.calltsm.com). Mounted with Premium Adhesive standard Styles shall be as follows:
1. CP-3548 - 4'-0" long.
2. EW Series for End Wall Guards - 4'-0" long x field measurement of web.
3. CP-Z2 Series Built-In Corner Guards at ceramic tile corners.

*****Hallways*****

B. Stainless Steel Corner Guards: Provide corner guards as manufactured by shall be manufactured from Type 304 (meets NSF Standard 51), 16 gauge, #4 Satin Finish, 90º, 1/8" radius, or degree/radius necessary for applicable corner, with 1-1/2" wing, 8 foot length. Fasteners shall be pre-drilled beveled holes and Phillips head screws.
1. Provide one of the following products/manufacturers:
IPC Door and Wall Protection Systems; InPro Corporation
Korogard, Koroseal Wall Protection Systems; Division of RJF International Corp.

*****Or*****

C. Provide ACROVYN SM-20 by Construction Specialties (800.233.8493, www.c-sgroup.com). Surface mounted guards consisting of a continuous aluminum retainer with snap-on vinyl acrylic cover. Provide color matched end caps. Length as indicated on drawings. Color to be selected by Architect from manufacturer's full color range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install corner guards in/on wall using manufacturer's anchoring devices and in compliance with manufacturer's instructions. Install true and plumb.
1. **Kitchen**: Cement on stainless steel corner guards shall be installed at all outside corners. Surface mounted stainless steel corner guards shall be applied with manufacturer supplied adhesive. Tops of corner guards in kitchen shall be sealed with clear silicone sealant.

2. **Drywall Hallways**: Install screw on stainless steel corner guards to wall securely using appropriate screws, as specified.

3.2 PROTECTION AND CLEANING

A. Protect surfaces from damage during construction.

B. At completion of the installation, clean all surfaces.

END OF SECTION

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Toilet accessories and warm-air hand dryers.

B. Related Sections:
1. Section 08 80 00 - Glazing: un-framed mirrors.
2. Section 10 21 15 - Solid Phenolic Toilet Compartments.
3. Section 12 56 70 - Changing Table.

1.2 SUBMITTALS

A. Product Data:
1. Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
3. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

1.3 QUALITY ASSURANCE

A. Products: Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same area.
1. Stamped names or labels on exposed faces of units will not be permitted.
2. Provide locks where specified, with the same keying for all accessory units in the project.

1.4 COORDINATION

A. Accessibility Standards: Coordinate accessory locations with other work to prevent interference with clearances required for access under Texas Accessibility Standards (TAS), Architectural Barriers Act--Article 9102, Vernon's Texas Civil Statutes and Texas Government Code, Chapter 469.

1.5 WARRANTY

A. Provide manufacturer’s written 10-year limited warranty for hand dryers.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Toilet accessories shall be of the quality manufactured by **Bobrick Washroom Equipment, Inc**. and are listed by Bobrick catalog numbers for convenience in identification. The use of a catalog number as a description of an item shall be taken to include the description or specification for the item in the manufacturer's catalog.

B. Toilet Accessories: Equivalent items of the following manufacturers are acceptable:
American Specialties, Inc.
Bradley Corp.
General Accessory Manufacturing Co. (GAMCO)
McKinney/Parker Washroom Accessories Corp.

2.2 BASIC MATERIALS

A. Stainless Steel: ASTM A 666, Type 304 with No. 4 satin finish.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30 castings.

C. Sheet Steel: ASTM A 1008, cold rolled, commercial quality.

D. Galvanized Steel Sheet: ASTM A 653, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electro-deposited on base metal.

F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q3, nominal 1/4" thick, with silvering, electroplated copper coating, and protective organic coating complying with ASTM C 1036.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

I. Keys: Provide universal keys for access to accessories for servicing and resupplying. Provide minimum of six keys.

2.3 ACCESSORIES

A. Grab Bars: Model B-6806, lengths as shown on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions and recommendations, using fasteners appropriate to substrate and recommended by manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Adhesive mountings and plastic rawl plug mounts will not be acceptable.

B. At toilets with wheelchair compartments all toilet accessories shall be installed so that operating areas such as coin slots, pushbuttons, openings for towels, cups and waste are not more than 48" above finished floor for frontal approach.

C. Attach dispensers and cabinets to steel stud partitions with suitable hollow wall screw anchors. Attach dispensers and cabinets to masonry partitions with stainless steel expansion shields and machine screws.

D. Attach sanitary napkin disposal units and toilet tissue dispensers to toilet partition panels with stainless steel or chrome plated through bolts and hex cap nuts.

E. Install grab bars to withstand a downward load of at least 250 lbf. Attach grab bars to toilet partition panels with stainless steel through bolts and plated hex cap nuts. Attach grab bars to steel stud partitions with connector assemblies to steel anchors fastened to studs. Attach grab bars to masonry partitions with stainless steel expansion shields and machine screws.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 44 13

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire extinguishers and fire extinguisher cabinets.

1.2 DEFINITIONS

A. Where indicated on the drawings the abbreviation "F.E.C." defines a fire extinguisher and cabinet and the abbreviation "F.E." is for fire extinguisher without cabinet.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include physical dimensions, operational features, color and finish, anchorage details, material descriptions and type of hardware.

C. Shop Drawings: Include rough-in measurements, locations, and details for cabinets.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this Section from one manufacturer.

B. Certifications
1. Provide extinguishers which are U.L. listed and bear the U.L. "Listing Work" for type, rating, and classification.
2. Conform to NFPA-10 requirements for extinguishers.
3. Provide units conforming with ANSI/UL 711.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store extinguishers in protected location until after final cleaning is completed.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not store products subject to freeze damage in environments where damage could occur.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Provide multi-purpose dry chemical type fire extinguisher, 10 lbs. nominal capacity. Provide manufacturer's standard hook type bracket where fire extinguishers are noted without cabinets. Product/manufacturer; one of the following:
   Cosmic 10E; J.L. Industries, Div. of Activar, Inc.
   MP10; Larsen's Manufacturing Co.
   Wing 10HB; Modern Metal Products
   Model 3010; Potter-Roemer

B. At Kitchen provide wet chemical type fire extinguisher with a Class K UL rating. Provide manufacturer's standard wall mounting bracket. Product/manufacturer; one of the following:
   Saturn 15 Model, JL Industries, Inc., Div. of Activar, Inc.
   WC-6L Series Wet Chemical, Larsen's Manufacturing Co.
   3260; Potter-Roemer/B260; Amerex

2.2 FIRE EXTINGUISHER CABINETS

A. Provide clear anodized aluminum trim and door. Doors shall be solid with vertical window and have continuous piano hinge. "Fire Extinguisher" vertical ascending silk-screened lettering in red. Product/manufacturer; one of the following:
   Fire-FX 1027V10 Academy; J.L. Industries
   FS AL2409-R4 Vertical Duo, Clear Acrylic; Larsen's Manufacturing Co.
   "Alta" Series No. 7043-DV-6; Potter-Roemer.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for type and capacity of fire extinguisher indicated, with plated or baked-enamel finish. Color shall be red.

B. Identification: Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface. Orientation shall be horizontal.

2.4 FABRICATION

A. Form body of cabinet with tight inside corners and seams.

B. Predrill holes for anchorage.

C. Form perimeter trim and door stiles by welding, filling, and grinding smooth.

D. Hinge doors for 180° opening with continuous piano hinge. Provide nylon roller type catch.

2.5 FINISHES

A. Extinguisher: Red enamel.

B. Cabinet Trim and Door: Clear Anodized Aluminum.

C. Cabinet Interior: White enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fire extinguisher cabinets at locations indicated in accordance with the manufacturer's instructions. Install level, plumb, secure. Install fire extinguisher cabinets with operable part of extinguisher at 48" above finished floor.

B. Install fire extinguishers within cabinets on mounting brackets, placed in such a manner that operating instructions face outward.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb. Apply identification decals above bracket-mounted fire extinguishers.

D. Service, charge (if required), and tag each fire extinguisher not more than five calendar days prior to substantial completion.

E. Maintain design of fire-rated partitions associated with cabinets.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 73 26

PREFABRICATED WALKWAY COVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefabricated wall-mounted canopies.

B. Related Requirements:
1. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Include drawings showing small scale layouts of prefabricated walkway canopies and large-scale details of edge conditions, joints, expansion joints, anchorages, trim, closures, and special details.

C. Samples: Submit two 12" square samples of finished metal panels.

D. Certification: Submit design calculations sealed and signed by an engineer registered in the State of Texas. Design calculations shall state that the protective cover system design complies with the wind requirements of all governing jurisdictions, the stability criteria of applicable building code, and all other governing criteria.

1.3 QUALITY ASSURANCE

A. Wind Loading: Fabricate and install prefabricated walkway canopies and other components of system to comply with code requirements for resisting wind effects based on a 120 mph wind.

B. Installer Qualifications: Engage an experienced installer who is an authorized representative of the canopy manufacturer and has completed installation of canopies similar in material, design, and extent to canopy required for this project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide prefabricated walkway canopies as manufactured by one of the following:
AVAdek
Dittmer Architectural Aluminum
Mapes Industries, Inc.

2.2 MATERIALS

A. Aluminum Sheets: Extruded aluminum sections, Alloy 6063, T6 temper.

B. Structural Supports: Extruded aluminum sections, Alloy 6063, T6 temper.

C. Fasteners: Manufacturer's standard non-corrosive types, with heads gasketed.

D. Accessories: Provide components required for a complete prefabricated walkway canopy system, including fascia, trim, closures, clips, fillers, and similar items. Match materials and finishes of prefabricated walkway canopy framing.

E. Finish: Bronze anodized.

2.3 FABRICATION

A. General: Fabricate and finish canopies and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and dimensional requirements. Internal gutters shall connect to weep system.

B. Wall-mounted Suspended Canopies:
   1. Gutter shall scupper out at each end.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive prefabricated walkway canopies for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General: Comply with canopy fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor supports and other components of the work securely in place, with provisions for thermal and structural movement. Install expansion joints to provide for thermal and structural movement.

3.3 CLEANING AND PROTECTION

A. Damaged Units: Replace canopies and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Upon completion of canopy installation, clean finished surfaces as recommended by canopy manufacturer, and maintain in a clean condition during construction.

END OF SECTION

SECTION 11 40 00

FOODSERVICE EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Documents, apply to the Work specified in this Section.

1.2 SUMMARY OF THE WORK

A. Location: Bryson ES, Elkins ES, Eagle Mountain ES

Fort Worth, TX

B. Approval of Working Surface: any contractor performing work over the work of other contractors shall notify the Architect of any unsatisfactory conditions. Beginning of work by any contractor shall constitute acceptance of the previous work.

C. Checking Dimensions at Site: before ordering any materials or doing any work, verify all measurements of the building and be responsible for the correctness of them. No extras will be allowed for variations from drawings in existing conditions or for work performed under this contract. Any discrepancies found shall be submitted to the Architect or Foodservice Consultant for instructions before proceeding.

D. Cutting and Patching: No excessive cutting will be permitted, nor shall any structural members be cut without the written approval of the Architect. Each Contractor shall leave all chases and openings straight, true and of the proper size in his work as may be necessary for the proper installation of his and other contractors' work. After such work has been installed, he shall carefully fit around, close up, repair, patch and point up same as directed, to the entire satisfaction of the Architect.

E. Cooperation: the General Contractor, all other contractors and all subcontractors shall coordinate their work with all adjacent work and shall cooperate with all other trades to facilitate the general progress of the work. Each trade shall afford all the other trades every reasonable opportunity for installation of their work and storage of their material.

F. Inspection and Tests: Architect, Owner, Foodservice Consultant and their representative shall at all times have access to the work whether it is in preparation or progress. Provide proper and safe facilities for such access and inspection.

G. Fees, Permits and Inspections: secure and pay fees for all permits, licenses and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations and contract requirements bearing on the work.

1.3 SCOPE

A. Include the Work specified, shown or reasonably inferable as part of Foodservice Equipment. Portions of this Work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

B. The General Contractor is responsible for Related Work specified in other Sections: i.e. final plumbing, electrical and mechanical connections. The Foodservice Equipment Contractor is responsible for all internal connections when specified.

C. Specifications and drawings have been prepared to form the basis for procurement, erection, startup and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not by the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Architect/Consultant prior to bidding.

D. Should the drawings disagree in themselves, or the specifications with the drawings, the better quality, more stringent, and/or greater quantity of the work or materials shall be completed without additional costs to the Owner.

1.4 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Slab depressions reinforced concrete wearing bed and interior finished floor with coved base at prefabricated cold storage assemblies: Divisions 03/09.

B. Concrete or masonry platforms with finished top and coved base at perimeter, for raised setting of foodservice equipment: Divisions 03/09.

C. Slab depressions to receive stainless steel drain trench liner/grate assemblies (provided under this Section): Division 03.

D. Dwarf-wall at exposed front/ends of cafeteria serving counters with finish as selected by Architect.

E. Corner guards: Division 09.

F. PVC or EMT Conduit with pull-wire and wide-sweep bends for refrigerant piping to remote foodservice equipment refrigeration systems: Division 22/26.

G. Empty EMT conduit with pull-wire and wide-sweep bends for interconnect cables between LAN and POS terminals, change-makers, pre-check units, printers, CPU's, etc.: Division 26.

H. Supply and exhaust fans for foodservice equipment and exhaust hoods: Division 23.

I. Roughing in and final connection of mechanical, electrical, and plumbing systems to foodservice equipment and cold storage assemblies by Divisions 22/23/26

J. Millwork /Casework Fixtures by Division 06.

1.5 QUALITY ASSURANCE

A. In addition to complying with applicable laws, statutes, building codes and regulations of public authorities, comply with the following:
   1. National Sanitation Foundation (all equipment to bear label).
   2. National Electric Code.
   3. Underwriters' Laboratories, Inc. (all applicable equipment to bear label).
   4. American Gas Association Laboratories.
   5. National Fire Protection Association.
   6. Americans with Disabilities Act.
   7. Food and Drug Administration HAACP Guidelines.
   8. International Conservation Code.
   9. Environmental Protection Agency

B. Furnish certification of regularly manufactured equipment listing or classification by Underwriter's Laboratories, Inc. with initial submittal.

1.6 SUBSTITUTIONS

A. Equipment items or components specified are intended to be the Basis of Bid. All other brands, including any additional names, which may be listed as “Alternates” or “Approved Equal,” must conform with the specifications, size, accessories, function, etc. of the first-named brand and be subject to Paragraph C-03 of this Article.

B. Proposed Substitutions:
   1. Submitted no less than 14 calendar days prior to Bid Date.
   2. Submit proposed substitutions with catalog data and/or manufacturer’s shop details indicating all modifications required to conform with specified brand.
   3. List of deviations must include listing of equipment name, model number, accessories and features with deviation(s) noted for both specified and proposed alternate equipment. Equipment without listed deviation(s) will be considered to be furnished as specified.

C. Substitutions with prior approval:
   1. Submitted on Bidder’s letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B02.
   2. Owner reserves the right to accept or reject any or all substitution proposals before execution of Contract.
   3. Provide all design/engineering services required to make adjustments in space, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

D. All appliances within common group or category (e.g., refrigerators, kettles, ovens, etc.): same manufacturer.

1.7 INTERPRETATION OF DOCUMENTS

A. During Bidding: contractor’s, supplier’s or vendor’s questions and comments pertaining to Construction Document’s clarity or intent will be addressed by addendum.

B. Subsequent to Award:
   1. Confirmation of Construction Document requirements will be provided by Clarification Bulletin.
   2. Request For Information Bulletins submitted by Contractor: contain Contractor’s proposed resolution.

1.8 WARRANTY

A. Provide a written warranty for a period of one year from the date of Substantial Completion, including extended four-year replacement warranty on compressor bodies.

B. Components of equipment subject to replacement prior to one-year’s use (such as refrigerator door gaskets) and those items which may fail due to improper or inadequate periodic maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.

C. Refrigeration Systems/Equipment: one-year free service available within twenty-four hours of notification.

D. Furnish three copies of a list of all equipment and their respective local service agencies, indicating the address, telephone number and name of person to contact. Whenever possible, the service agencies selected shall be factory-authorized for the equipment assigned.

E. Provide following for refrigeration systems/equipment, unless specified otherwise:

1. One (1) year free service available within twenty-four hours of notification, for refrigeration systems.
2. Provide five (5) year manufacturer's registered written replacement, warranty certificate, covering compressor bodies. Warranty to cover labor costs for first year.
3. Provide ten (10) year manufacturer's registered written replacement/repair, warranty certificate, covering walk-in panels. Warranty to cover defects in material and workmanship. Warranty to cover labor costs for first year.
4. Provide one (1) year parts and labor warranty for all parts of refrigeration system(s) and walk-in cooler(s) and freezer(s), not otherwise covered herein.

F. All above stated warranty periods are from date of Substantial Completion.

1.9SUBMITTAL DATA

A. Special Requirements: the following are in addition to any general requirements given elsewhere in the Documents.

B. Submittal Requirements:
1. Kitchen Equipment Contractor to furnish two (2) hard copies of all submittal drawings, two (2) hard copies of the brochures, Adobe PDF files on CD or via email of all submittals as indicated within the General Specifications.
2. Submittal data can be submitted electronically, in PDF format only, printed to scale, if acceptable by the Architect.
3. All shop drawings, rough in drawings, manufacturer drawings, and custom fabricated drawings to be included within one (1) complete submittal package.
4. Reviewed submittals are to be printed as required for each trade by the General Contractor and/or Kitchen Contractor.
5. Foodservice Design Professionals requires a minimum 10 business day review period after receipt of complete submittal package. Review period subject to size and scope of project.

C. Brochure Format (for regularly-manufactured equipment and components):
1. Front and rear protective cover with labeled project name.
2. Brochure index: indicate functional Area/Room number, item number, quantity, description and manufacturer.
3. A separate flysheet for each component or item of equipment, indicating: item number, name, quantity, manufacturer, optional equipment, modifications, special instructions and utility requirements. An item of equipment or assembly containing more than one buyout sub-assembly or component shall have the secondary item listed in parenthesis beside the primary item name. For example: Serving Counter (hot food well).
4. Catalog specification sheet and manufacturer's drawing.

D. Shop Drawings (Rough-In Drawings):
1. Separate drawing sheets: same size as Contract Drawings (Contract Drawings are not to be traced or reproduced). Submittal drawings are to be provided by Kitchen Equipment Contractor and not reproduced from Contract Documents. Any reproduced submittal drawings will be rejected.
2. ¼" scale drawing of fixed/movable Foodservice Equipment and pre-fabricated Cold Storage Assemblies with itemized schedules.
3. Special Conditions Drawings, sizing and locating the following conditions:
    a. Slab depressions, cores, sleeves or block-outs (cold storage assemblies, drain trenches, piping, etc.).
    b. Concrete or masonry platforms.
    c. Pipe sleeves or roof jacks.
    d. Wall-openings or block-outs for pass-through equipment, recessed control panels, in-wall fire-protection system components, etc.
    e. Blocking grounds or anchor plates required in walls for equipment support/attachment.
    f. Above-ceiling hanger assemblies for support of exhaust hoods, utensil-racks, etc.
    g. Access panels in walls or ceiling for service of equipment.
    h. Ceiling pockets or recesses for unusually high equipment.
    i. In-wall carriers for wall-hung or cantilevered equipment.
4. Electrical rough-in drawing.
5. Plumbing/mechanical rough-in drawing.

6. Required information:
   a. All fixed and movable Foodservice Equipment shown on Contract Drawings.
   b. All prefabricated Cold Storage Assemblies and Conveyor/Dishtable Assemblies shown on Contract Drawings.
   c. All general-use and convenience utilities or services indicated on Contract Drawings, including those required by or connected to equipment or devices not in this Section.
   d. All rough-in drawings: fully dimensioned from engineering benchmark or finished-room surface to point of stub-up through floor and stub-out through wall or ceiling for all mechanical, electrical and plumbing services.
   e. Connection number/tag system and symbols: identical to Contract Drawings.

E. Shop Drawings (Manufacturer's and Fabricator's):
1. Sheet Size: identical to Contract Drawings, drawn or plotted at ¾" scale for plan view and elevations; 1½" scale for sections and construction details.
2. Included information: item number, name and quantity.
3. Construction details, sections and elevations to reflect requirements of the Specifications and Drawings.
4. Indicate adjacent walls, columns and equipment.
5. Indicate plumbing and electrical schematic drawings for equipment such as: conveyors, waste systems, self-cleaning exhaust hoods, exhaust hood fire protection systems and fabricated fixtures with single electrical or plumbing connection.
6. Mechanical or electrical operating components or products integrated into a fabricated fixture: ventilation and service access required or recommended by the manufacturer, including panel size and location to permit easy lubrication, adjustment or replacement of all moving parts.

F. All equipment and engineering rough-in plans sheet numbers are to match the contract documents. All equipment item no.'s and engineer item no.'s located on the schedules are to match the contract documents. All engineering requirements are to be updated as required to accommodate the provided equipment and/or match the contract documents. The Kitchen Contractor is responsible for the coordination of any MEP revisions to accommodate the provided and proposed equipment. The kitchen contractor is responsible for any cost associated to equipment substitution.

1.10 SERVICE MANUAL

A. Three copies bound in 1½" hardback, three-ring binders (as many volumes as required by scope of project) with same data as brochure at completion of installation (Refer to "Submittal Data"). Provide separate service manuals as required for each independent area within the project scope (Main Kitchen, Culinary, Concession, etc.).

B. Each Volume: section for maintenance of finish materials (e.g., stainless steel, plastic laminates, FRP, Plexiglas, etc.).

C. Catalog specification sheet and/or manufacturer's shop drawings.

D. Each Volume: index of items, manufacturer's operating/maintenance information, replacement parts data and price lists. Provide the name, title and address of personnel at each respective manufacturer to be contacted for spare/replacement parts after warranty period.

E. To the extent possible, provide two copies of manufacturer's video instructional cassettes for operating, maintenance and service of equipment.

F. Internally subdivide binder contents with permanent page dividers, logically organized by equipment item number or manufacturer name, with tab titling clearly printed under reinforced laminated plastic tabs.

G. Electronically submitted manuals are required to follow the same formatting requirements listed above.

1.11 VERIFICATION AND COORDINATION OF PROJECT / DATA

A. Utilities Rough-in Drawings and Field-Services within four weeks after receipt of notice-to-proceed, review Contract Drawings and Submittal Data for accuracy and completeness and notify Architect of conflicts and proposed adjustments. Coordinate work with other sub-contractors.
   1. Provide on-site field verification of all underground utilities prior to pouring of concrete for capacity and location, coordinate with General Contractor. Submit review to Architect and General Contractor.
   2. Provide on-site field verification of all other utility connections and locations, coordinate with General Contractor. Submit review to Architect and General Contractor.

B. Review critical systems/components for application, performance and capacity and submit calculation worksheets with initial submission of brochure/rough-in drawings, with all proposed adjustments noted, including:
   1. Exhaust hood removal/supply air volume, velocity, static pressure, duct collar sizes and locations.
   2. Refrigeration Systems (compressor, condenser and evaporator) capacities/sizes, quantities and refrigerant piping distances/sizes.
   3. Exhaust Hood Fire Suppression Systems (nozzle locations, air handler and fuel interlocks, piping/distance limitations).
   4. Locations of Vacuum Breakers.
   5. Conformance of Refrigerated Components/Equipment with HACCP Guidelines (e.g., salad/sandwich pans, upright/open refrigerator cabinets, salad bars) with HACCP Guidelines.
   6. Gas, water line sizes and manifold configurations.
   7. Diameter and length of flexible connector lines for fixed/movable gas appliances.
   8. Fabricated Equipment load center panels (individual and total amperage calculations and circuit balance).
   9. ADA compliance of workstations, service positions, passageways, etc.

C. Ceiling mounted appliances/fixtures: verify and coordinate dimensions/location of support framing/hangers with General Contractor. All material and installation below 12'-0" aff.: Section 11 4000.

D. Dimension Responsibility: obtain actual or guaranteed measurements for proper fit of equipment. All dimensions indicated in Contract Documents are approximate and are as accurate as can be determined at the time. Field-check all horizontal/vertical measurements and conditions at the building prior to fabrication or delivery of equipment and notify the Architect of all conflicts or deviation from the dimensions shown.

E. Checking Dimensions at Site: before ordering any materials or doing any work, verify all measurements of the building and be responsible for the correctness of them. No extras will be allowed for variations from drawings in existing conditions or for work performed under this contract. Any discrepancies found shall be submitted to the Architect for instructions before proceeding.

F. Scheduling to Fit Openings: should it become necessary to schedule construction of walls or partitions prior to delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions, including vertical handling limitations within the building (elevator cabs or openings, stairs, etc.) and possible hoisting requirements. Coordinate all procedures with General Contractor and Project Team.

G. Refrigerated and Dry Storage Areas: verify and coordinate dimensions to accommodate scheduled modular shelf sections. Notify Architect of variance between the Contract Documents and actual conditions.

H. Color/Pattern Selections: submit selection samples of solid polymer products, plastic laminate, paint or stain finishes and vinyl-coated surface material of equipment as selected by Owner.

I. Movable Equipment Interface: rolling stock (pan racks, carts, dollies, dish/tray/rack dispensers) required to fit through or into fixed equipment (roll-in refrigerators, counter bodies, etc.) is to be reviewed and coordinated for compatibility at time initial of shop drawing submittal. Indicate conflicts and proposed adjustments.

J. Relocation of Work: relocate or re-route work as required to coordinate related items free of charge if no extra work is involved.

1.12 EQUIPMENT FURNISHED / INSTALLED BY OTHERS

A. Obtain and coordinate utility requirements of Owner-Furnished/Owner-Installed (OF/OI) equipment with the building utilities and roughing-in drawings/provisions.

B Coordinate physical data of OF/OI appliances or equipment and incorporate information into Submittal Drawings. Vendor- or Purveyor-Furnished equipment (e.g., coffee/tea equipment): same as OF/OI.

1.13 WORK INSTALLED BUT FURNISHED BY OTHERS

A. Coordinate delivery/installation schedule of Owner-Furnished/Contractor-Installed (OF/CI) equipment with Owner not less than ninety (90) days before equipment requirement.

B. Obtain and coordinate utility requirements of OF/CI equipment with the building utilities and roughing-in drawings/provisions.

C. Receive at job-site and fully incorporate into installation procedures as if furnished under this Section.

PART 2 - PRODUCTS

2.1 FABRICATED FIXTURES MATERIAL / COMPONENTS

A. Stainless steel sheets or shapes: 18-8, Type 302, polished to 180 grit No. 4 finish.
1. Stainless steel joints and seams: heli-arc welded, free of pits and flaws, ground smooth and polished to No. 4 finish.
2. The “grain” direction of horizontal stainless-steel surfaces: longitudinal, including the splashback. The polishing procedure at right-angle corners of fixtures shall provide a mitered appearance.

B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/Paint Grip.
1. Galvanized iron joints and seams: arc-welded, free of pits and flaws and ground smooth.
2. Galvanized sheets or shapes: washed with mineral spirits and painted with Rustoleum gray semi-gloss enamel.

C. Sound Deadening: Schnee Butyl Sealant ½” wide rope positioned continuously between all frame-members or contact material and underside of stainless-steel surface (sinks, table tops, food wells, over shelves and undershelves). Tighten stud-bolts for maximum compression of sealant and trim excess.

D. Plastic Laminates: color/pattern selected by Architect, in 1/16” thickness for flat surfaces: 1/32” thickness for radiused surfaces. Plastic laminates and adhesives must be N.S.F. approved (Standard No. 35).

E. Solid Polymer products: color/pattern/material as selected by Architect in thickness as specified. Solid Polymer and adhesives must be N.S.F. approved (Standard No. 51).

F. Casters.
1. Fabricated fixtures with “Open Base” construction: Jarvis and Jarvis Model No. 5-405-113P-NSF swivel casters with grease seals on forks and wheels; Zerk fitting in swivel; two casters: Model No. E-75 Vertilock brakes. All casters: B-7” rolling bumpers with stainless steel top discs.

G. Cutting Boards: 1/2” thick Read Products, Inc. “PolyLite” cutting board, size as indicated.

H. Identification Plates, Labels, Tags:
1. Prohibited Information: names of suppliers, fabricators and contractors.
2. NSF Labels: required on all pieces of equipment.
3. Required Information: function or purpose of controls such as display light switches, food warmer controls, etc.
4. Plate Construction: engraved phenolic plastic, secured to equipment with epoxy cement or stainless-steel screws. Furnish samples.

2.2 PLUMBING / MECHANICAL REQUIREMENTS

A. Plumbing Fittings and Components: furnished under this Section as follows:

Note: Fitting and components described in Items 1, 2, 3,4 and 5 are furnished loose for installation by Division 22.

1. Control valves, appliance pressure regulators for water, gas and steam, and vacuum breakers: wherever required on Foodservice Equipment (chrome-plated where exposed).
2. Faucets and drains without connected overflows (unless otherwise indicated) for all sinks.
3. Specialty Foodservice water-fill faucets or hose assemblies indicated in drawings/specifications.
4. Wade Model No. W-10 Shock-Stop shock absorbers for all Foodservice Equipment with quick-opening or solenoid-operated water valves.
5. Dormont Stainless Steel Water Quick Disconnect hose, diameter per water connection size requirements, with SafetyQuick safety fitting, w/coiled restraining device, full port gas valve, antimicrobial coating, lifetime warranty.
6. Extensions of indirect waste fittings to open-sight floor sink or floor drains from sinks, under bar equipment, and food-holding components of serving counters (e.g. cold pans, hot food wells, refrigerator/freezer coils not equipped with condensate evaporators) furnished and installed by Division 22. Drains: painted with aluminum paint where exposed, type “K” copper where concealed.
7. Piping brackets and supports beneath/within fabricated equipment.
8. Closed Base Bodies: removable 18-gauge stainless steel closure panel at plumbing penetrations, under top.
9. Control valves on Open Base fixtures: mounted on 14-gauge stainless steel gusset-shaped panel with 3½” setback from counter top edge/rim to face of control handle.
10. Fill hose/faucet at support pedestals or Closed Base Body: installed in a 15” x 18” x 5” deep recessed mounting panel. Panel bottom: sloped on a 60o angle, with 3/8” stainless steel rod hanger-bracket for hose.
11. In-line water filter system:
    a. Everpure System filters for coffee/tea brewers, icemakers, water chillers, convection steamers and beverage systems.

B. Gas-Heated Equipment Fittings and Components: furnished under this Section as follows:
1. Fixed Equipment: Dormont MFG brand “KITCF” Series gas hose kit with Quick Disconnect fitting at appliance. Approved equal: T&S Brass. Diameter per fuel volume/connection size requirements. Gas valve diameter size per fuel volume/connection size requirements.
    a. Restraining device: heavy duty steel cable, fastened to equipment and walls, 3” to 6” shorter than equipment connector length.

C. Final Plumbing Connections Provisions.
1. Fabricated equipment containing components, fittings and/or devices indicated on Foodservice Connection Drawings to be connected to the building systems: each component, fitting or group thereof pre-piped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.
2. Field-assembled equipment (e.g., prefabricated walk-in refrigerator/freezers, exhaust hoods, warewash machines, convection ovens, etc.): plumbing components completely interconnected under this Section for final connection arrangements indicated on Utility Connection Drawings.
3. All plumbing final connection points of equipment shall be tagged, indicating:
    a. Item number.
    b. Name of devices or components.
    c. Type of utility (water, gas, steam, drain, chilled water).

D. Ducts and Vents.
1. Exhaust hoods which are furred-in to ceiling: 2” high duct collar for final connection to duct system.
2. Warewash machines equipped with integral vent cowls or extended hoods: furnished with 18-gauge stainless steel seamless duct risers to 6” above finish ceiling for final connection. The duct: trimmed at ceiling with 16-gauge stainless steel angle flange with all corners welded.

2.3 FOODSERVICE EQUIPMENT REFRIGERATION SYSTEMS

A. Install complete with all refrigerant, oil, dials, dehydrators, gauges, controls required for the proper operation of the system.

B. Self-contained or factory-installed compressors: check and adjust to proper operating temperature prescribed by FDA/HACCP.

2.4 PLUMBING TRIM

A. Faucets: furnished for all sinks or equipment requiring open water supply.

B. Fill Faucets: furnished for appliances requiring open water supply.

C. Drain Fittings: furnished for all sinks or equipment requiring removal of liquids. Install specified chrome-plated or stainless-steel fittings in die-stamped openings with washers and locknuts. Solder may be used as a sealer but shall not be applied to the top surface of the drain fittings.

2.5 ELECTRICAL REQUIREMENTS

A. All electrical systems, components and accessories within the work of this Section: certified to be in accordance with NEC 70.

B. Electrical Fittings and Components: furnished under this Section as follows. Coordinate foodservice equipment loads, voltage and phase with building system and confirm any existing or OF/OI equipment requirements.

C. Cord and Caps.
1. Coordinate all Foodservice Equipment cord/caps with related receptacles.
2. All 120 volt “plug-in” equipment shall have Type SO or SJO cord and plug with ground wire fastened to frame/body of item.
3. Cord lengths for fixed equipment: adjusted to eliminate loose-hanging excess.
4. All non-fixed plug-in “buy-out” equipment: Hubbell configuration, ratings as required.
5. All mobile electrical support equipment (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutters, toasters, coffee makers, microwave ovens, etc.): 8’-0” cord length with cord-hanger strap secured to rear of equipment or mobile stand.

D. Switches and Controls.
1. Each motor-driven appliance or electrically heated unit: equipped with control switch or starter per Underwriters’ Laboratories, Inc. with low-voltage and overload protection.
2. Disposer controls recess-mounted in wall: external fittings and accessories removed from enclosure and furnished with 16-gauge stainless steel perimeter angle flange with welded corners. Install control at 4’-0” aff to bottom of enclosure.
3. Disposer controls recess-mounted in counter-splash risers: external fittings and accessories removed from NEMA 4 enclosure and furnished with 16-gauge stainless steel perimeter angle flange with welded corners. Install control at 3’-0” aff to bottom of enclosure. Provide panel with 60” long coil of Seal-Tite electrical conduit, from bottom of control panel for final field connections under Division 26.
4. Equipment which is not provided with built-in circuit breakers or fused terminal block and is indicated on Utility Connections Drawings to be directly-connected to the building electrical system: a NEMA 4 stainless steel disconnect switch furnished and installed by Division 26.
5. All remote manual starters, disconnect switches, magnetic contactors or starters and push-button stations: NEMA Type 4 enclosure; NEMA Type 1 enclosure only when installed in a Closed Base Body.

E. Heating Elements.
1. Electrically-heated equipment: thermostatic controls.
2. Water heating equipment: equipped with positive low water shut-off.

F. Receptacles and Switches.
1. Receptacles installed in vertical panels of support pedestals or Closed Base Bodies: installed in 12” x 8½” x 3” deep recessed mounting panel sloped on 60o angle and turned up to top of opening.

2. Pre-wire receptacles in closed base fixtures to a junction box installed within 6" from bottom of utility or compressor compartments.
3. Receptacles mounted on Open Base fixtures: installed on 12" x 10½" x 4½" deep 14-gauge stainless steel panel with returned ends and sloping recess. Secure panel to underframe of fixture top.
4. Pre-wire receptacles on open base fixtures to a junction box secured to a leg or mounted on underside of lower shelf. Vertical runs of wiring: made in rigid conduit or within the tubular leg.
5. Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies horizontally-mounted in a metal box with stainless steel cover plate.
6. Switches installed in/on-fabricated equipment: Hubbell, Inc. with metal box and stainless-steel cover plate. Switches: pre-wired to the controlled device and to a junction box installed within 6" from bottom of utility or compressor compartment. All refrigeration system switches: installed within the compressor compartment near the door opening.
7. Load centers installed in/on fabricated equipment to have all fixture components pre-wired to load center with balanced phase loading. Load center: ready for final connection by Division 26 and flush-mounted within utility compartment rear panel, set back 8" from access door. All breaker/device information: type written on circuit typewritten on circuit schedule in load center door (number corresponding breaker/device) with enclosed schematic wiring diagram of fixture components.
8. All receptacles to be pre-wired to cord and plug assembly and routed through overshelf post at all island equipment locations, unless specified otherwise.

G. Light Fixtures.
1. Light fixtures with lamps installed in/on fabricated or field-assembled equipment: pre-wired to a junction box for final connection (continuous-run fixtures when indicated).
2. LED Display Light: install light fixtures full-length of Display Stand and Serving Shelf with stud bolts and pre-wire through support posts to an apron-mounted switch.
3. Heat Lamps: installed to underside of serving shelf assemblies. When multiple 24" heat lamps are specified, provide maximum length heat lamp chassis. Install all switches remote from lamps.
4. Cold Storage Light Fixtures: Furnished by Section 11 40 00 and installed by Div. 26. All electrical wiring and conduit provided by Div. 26. Electrically connected through the hub fitting located on the top of the fixture. All horizontal conduit: above ceiling panels. Install plastic sleeve through ceiling panels for electrical conduit. Seal sleeved penetration airtight at both sides of panel. All penetration to be sealed by Kitchen Equipment Contractor.

H. Final Electrical Connection Provisions.
1. Fabricated equipment containing electrically-operated components or fittings indicated on Utility Connections Drawings: direct-connected, with each component, fitting or group pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.
2. Fabricated equipment containing electrically-operated components and/or devices indicated: circuit-breaker load center with each component or device pre-wired to a separate circuit breaker for balanced phase loading and single final connection by Division 26.
3. Field-assembled equipment (e.g., prefabricated cold storage assemblies, exhaust hoods, warewash machines, etc.) shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawings by Division 26.
4. Pre-wire the following groups of cold storage assembly electrical devices to a top-mounted junction box for final connection by Division 26 per compartment grouping (unless otherwise indicated).
a. Light fixtures and switches; heated pressure-relief vent.
b. Door/jamb heaters.
c. Evaporator fans defrost elements and drain line heaters.
5. All electrical final connection points of equipment shall be tagged, indicating:
a. Item number.
b. Name of devices on circuit.
c. Total electrical load.
d. Voltage and phase.

I. Lamps: in all Foodservice Equipment containing light fixtures. Refrigerator or heated cabinets: All exposed LED lamps above or within a food zone: Shat-R-Shield lamps or standard lamps, sleeved with end caps.

2.6 CUSTOM - FABRICATED / ASSEMBLED UNITS

A. Mechanical or electrical operating components or products integrated into a fabricated fixture: ventilation and service access required or recommended by the manufacturer. The service access panel(s) size and placement is to permit easy lubrication, adjustment or replacement of all moving parts and is to be indicated on fabrication shop drawings.

2.7 BAKER TABLE TOPS (Unless specified otherwise)

A. 14-gauge 304 S/S top with 2" square turn down at front, 6" high enclosed splash at three (3) sides and rear. Brace same as "Counter/Table Tops".

B. 1¼" x 6" high integral coved riser at rear and ends unless indicated otherwise on drawings.

C. 16-gauge stainless steel flour-trough at free long sides, secured to underside of top. Trough: 3" diameter with eased edges/corners.

2.8 COUNTER / TABLE TOPS

A. 14-gauge stainless steel; all free edges turned down 2" with ¾" tight hem at bottom. Free corners: rounded on ¾" radius.

B. Marine edges: turned up ½" on 45º angle and turned down 2" with ¾" tight hem at bottom.

C. Cafeteria serving counter tops at hot food stations: full-length x 3½" x ½" high raised rail at (customer's) front side with 45º integral turndown to counter surface.

D. Tops abutting high fixtures or walls: cove up specified height and slope back 1½" at top on 45º angle; 2½" slope where piping occurs. Turn down 1" at rear of splash and close ends to bottom of top turndown. Secure splash turndown to wall with 4" long 14-gauge stainless steel "Z" clip anchored to wall, 36" o.c.

E. Freestanding tables and all serving counter splash-risers: turned back on 90º angle with 1" turndown at rear.

F. Brace tops with rigid-welded 1½" x 1½" x 1/8" galvanized steel angle frame at perimeter with cross bracing 2'-0" o.c. maximum. Provide 4" x 4" x 12-gauge stainless steel triangular pads where leg gusset welds to frame. Paint entire frame with Rustoleum gray semi-gloss enamel. Angle frames: secured to underside of top surfaces with ¼" studs welded 9" o.c. maximum with chrome-plated washer, lock washer and capnut. Studs: such length that cap nuts can be made-up tight, bringing top down snugly on angle frame eliminating all vibrations or "oil-canning".

G. Tops: 1½" overhang at free sides of underframe or Closed Base Body.

H. Mockett Model No. SG5-26 chrome-plated/plastic grommet assembly or integrally-welded stainless-steel flange or inverted gusset where service utilities or support posts penetrate or abut tops, ground and polished to match top. When conditions permit, provide a 1" x 1½" rectangular opening in the backsplash for service utilities in lieu of piercing the horizontal surface. Install stainless steel split-tubing at raw-edge of opening.

I. Extend underbracing members to wall, turn down 6" and anchor to wall when specified to be mounted on leg/bracket assembly.

J. All openings in tops: 3/16" high raised die-formed edges.

K. All top openings for pans or inserts: 20-gauge stainless steel, watertight liners, 8½" deep, secured to underside of counter top.

L. All "built-in" and "drop-in" counter equipment/appliances: with framing members at perimeter of opening.

M. Scrap Container: 18-gauge stainless steel construction 6½" x 6½" x 21¾" long. Top of container: 5/8" wide x ¼" high full perimeter flange with ¼" diameter stainless steel rod bail handle. Interior vertical corners coved on ½" radius. Counter top: fitted with 6¾" square die-stamped opening.

2.9 COLD PANS

A. 14-gauge stainless steel with ¾" coved interior welded integrally to counter top with 3/16" raised edge at perimeter of opening. Depth of Cold Pan: NSF 7 compliance.

B. Slope bottom to required quantity of Component Hardware Model No. E16-4021 drain fittings at 48" o.c. maximum. Sleeve through insulation at drain fittings and extend common drain line into utility compartment for indirect waste connection.

C. ½" o.d. copper refrigerant lines in serpentine patter, 1½" o.c. flattened for maximum contact. Secure tubing to underside of ¼" thick aluminum "distribution plate" installed tight to underside of frost plate area and apply cold-conductive mastic to all surfaces.

D. Component Hardware Model No. E16-4021 drain fittings at 48" o.c. maximum, sleeved through insulation with common drain line extended into utility compartment.

E. Heat Cable: low-wattage, full-perimeter, below counter top at edge of depression. Secure with "Z" clips, 9" o.c. and interwire with compressor switch for simultaneous operation.

F. Enclose sides and bottom of pans with airtight 18-gauge galvanized jacket and pack with 2" fiberglass insulation set in mastic.

G. Compressor: size as indicated or required to accommodate size of cold pan. Locate compressor in compressor compartment below unit or as indicated on drawings.

H. Sectional 16-gauge stainless steel perforated false bottom (¼" holes, @ ¾" o.c.). Turn down 1½" all sides, weld corners and provide finger rings. False bottom sections: 24" long maximum.

2.10 DRAWERS

A. Liners: Component Hardware Model No. S80-2020 (20" x 20"), easily removable with drawer in fully extended position.

B. Drawer Frame: 16-gauge stainless steel flanged out at top. Weld the frame to double-paneled 16-gauge stainless steel drawer front with full-length recessed pull at top (similar profile as Garcy Model No. R-1060) with closed ends.

C. Channel-formed horizontal pull: ¾" turndown at front and ends with ½" tight hem. Front edge of pull: flush with face of drawer. Recess behind pull: sloped up on 60o angle, terminating 1" below bottom edge of pull.

D. Mount drawer frame on Component Hardware Model No. S26-0024 self-closing slides, with solid nylon rollers, full-depth of fixture. Secure slides to body or brackets to eliminate lateral movement in extended position. Refrigerator drawers: Component Hardware Model No. S52-2024 stainless steel slides with Delrin rollers.

E. Drawer enclosure in an Open Base Fixture: 18-gauge stainless steel flanged out at top for attachment to underside of tabletop. Lower edge of enclosure is flanged in toward open bottom. Mount drawer slides to enclosure and brace as required. Face of enclosure is to be same length and height of drawer face. Provide ¾" deep offset in front of enclosure and 2½" from underside of table top for flush-fitting appearance. Drawer enclosure on freestanding fixture: full-depth of table framing.

F. Drawer enclosure in a Closed Base Fixture: completely partitioned from adjoining area. Drawer front: flush-fitting with face of body.

G. Drawer Liners other than tool/utility: Bread Drawer: Component Hardware Model No. S83-2020; Refrigerated Drawer: Component Hardware Model No. S81-1520 stainless steel liner.

H. Cash Drawer: integral stainless-steel body, 3" deep.

2.11 FOOD WELLS (UNLESS SPECIFIED OTHERWISE)

A. Food Warmer Controls: remote-mounted in sloping recessed apron panel. Control panel is recessed 2½" from bodyline at top of 60o slope, 1" at lower edge. Terminate slope angle 2½" below counter top. Mount panel on concealed piano hinge at bottom edge; secure with screws at upper corners.

B. Manifold all warmer drains and extend to within utility compartment for indirect waste connection. Install valve in drain line and extend handle through compartment door.

C. Removable 18-gauge stainless steel closure panel at underside of warmers.

D. 14-gauge stainless steel plate/utensil shelf full-length of hot food station unless noted otherwise: 10" below counter top x 9" deep, with rear panel coved up to underside of counter top; end panels turned up square. Front of shelf: turned down 1½" and returned under for closure panel attachment.

E. Food wells: Hatco Model No. HWBIBRT-FULD insulated food warmer (1200 watts, 208 volts, single phase) secured to underside of 12" x 20" die-stamped counter top openings with thermal breaker mastic rope applied at perimeter of food well flange.

F. Soup Warmers: Hatco Model No. HWB-11QTD soup warmer secured to underside of 11" diameter die stamped counter top opening with thermal breaker mastic rope applied at perimeter of soup well flange. Maximum allowable temperature of counter top at contact surface: 120oF. Each warmer: equipped with one 11-quart stainless steel round insert and slotted cover.

G. When specified: 5/8" deep recess in counter top full-length of pan-opening or as shown, with equal-length removable ¾" thick Read Products "PolyLite" cutting board sections, 42" long maximum. Recess and board: spaced 2" from front edge of pan opening and extended to leading edge of counter top.

2.12 SINKS

A. 14-gauge stainless steel; all interior corners (horizontal/vertical) coved on ¾" radius. 1½" wide double-walled partitions with flat tops between compartments.

B. Continuous exterior panels of multiple-compartment sinks: 14-gauge stainless steel filler panel welded, ground and polished between compartments.

C. Sinks (with overflow): score and slope sink bottom ½" to die-stamped opening fitted with Component Hardware Model No. D50-7215 rotary drain with connected overflow and tailpiece. 14-gauge stainless steel bracket: welded to sink bottom for drain stem with 1½" handle clearance.

D. Where sinks are installed in fixture with Closed Base Body, provide a Component Hardware Model No. D50-7215 rotary drain with connected overflow and tailpiece. (Sinks with dimension larger than 20" x 20" in Closed Base Body will not have overflow fitting.) 14-gauge stainless steel bracket: welded to sink bottom with T & S Model No. BL-4740-1 guide bushing. Install on shortened drain stem, one T & S Model No. BL-4710-1 remote control stem assembly only (length as required) with Model No. 113-L universal joint and white blank button. Set drain control handle in Cambro Model PSB-6 bowl with bottom omitted (dress raw edge) to permit passage of drain handle. Secure bowl in utility compartment door or body panel with clear silicone.

E. When single-hole deck-mounted faucets are specified, install overflow fitting in sidewall of sink compartment and provide ell-fitting in connecting tubing.

F. Flush Covers when specified: 1/2" thick Read Products, Inc. "Richlite" cutting board, size as indicated. Support clips: ¼" stainless steel rod 2" long, formed at 45º with two ¾" leg ends (¼" long threaded ends). Insert rod-clips through tight-clearance holes in sink, seal watertight and secure with stainless steel acorn-nuts or tack-weld at exterior of sink wall. Set support clips ½" below top. Provide 14-gauge stainless steel channel or angle support frame to store covers when not in use. Cover holder: adjacent to sink compartment, below counter top or under drawer assembly.

2.13 TRAYSLIDES (UNLESS OTHERWISE SPECIFIED)

A. Trayslides: 12" wide, solid 16-gauge stainless steel turned up 2" at rear behind counter top turndown; turned down 4" at front and free ends, unless otherwise indicated.

B. Three ¼" high die-formed inverted "vee" ridges at 4" o.c., 2" from leading edge, terminating 2" from ends of trayslide with tapered ridge-ends.

C. Ridges formed on radius: equal-length segments with 2" separation between chords.

D. Secure trayslides to counter-top/body frame, same as "Counter Tops." Enclose exposed underside of trayslide with 18-gauge stainless steel.

E. When indicated, project trayslides 2" beyond serving counter top and return the full-width of serving counter at free ends.

F. All tray slides to be provided and mounted per ADA requirements.

2.14 DISHTABLES

A. Soiled/clean dishtable: 14-gauge stainless steel; free edges coved up 3" with 1½" diameter rolled rim and bullnosed corners.

B. Edge of dishtables next to high fixtures or walls: coved up 10" and sloped back 1½" on 45º angle; 2½" slope where piping occurs. Turn down 1" at rear of splash and secure to wall with 4" long 14-gauge stainless steel "Z" clips anchored to wall, @ 36" o.c.

C. Exposed rear splash: 16-gauge stainless steel finish panel from top of splash to bottom edge of rolled rim with welded vertical joint at end. Secure panel with concealed attachment and install bracing 24" o.c.

D. Cove all interior corners (horizontal/vertical) on ¾" radius and slope tables 1/8" per foot to sinks, scuppers or warewash machines, maintaining level crown/splash.

E. Brace dishtables with 1" x 4" 12-gauge stainless steel channels down centerline of top and between each pair of legs, with closed ends. Bracing: secured to underside of dishtable with ¼" studs welded 6" o.c. maximum, with chrome-plated washer, lock washer and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down on the channel-members, eliminating all vibration and "oil-canning."

F. Integrally-welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops; ground and polished to match top.

G. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8" stainless steel rod hose hanger.

H. Extend underbracing members to wall, turn down 6” and anchor to wall when specified to be mounted on leg/bracket assembly.

I. Paper-Drop Opening: 9” square with 4” integral chute having hemmed bottom edge. Slope dishtable top 1” toward opening, forming a 16” square tapered deposit point.

J. Accessible Tray-Drop Opening: 10” x 18” with integral 16-gauge stainless steel seamless chute sloped on 45º angle toward center of mobile soak sink position.

2.15 DISH / TRAY DEPOSIT ASSEMBLY

A. 14-gauge stainless steel deposit shelf, size as indicated. Extend shelf through opening, flush with public side of partition, height as required by local code authorities. Turn shelf down 1” at front with ¾” return at bottom (either scribed into partition or forming reveal). Shelf: 1” square turndown at rear long side, integral with conveyor slider pan, tray-accumulator or dishtable. Extend rear/end splash to align with head of deposit station opening. Modify rolled rim at the operator’s side of the tray drop window to have a 3" rolled rim.

B. 18-gauge stainless steel window frame with perimeter flange channel-formed 1” x ¾” at both sides of wall. Weld all corners of frame and install with concealed attachment. Align/abut one jamb of frame with end splash of conveyor slider pan or dishtable whenever adjacent.

2.16 UTENSIL - WASH COUNTERS

A. 14-gauge stainless steel; all free edges coved up 3” with 1½” diameter rolled rim and bullnosed corners.

B. Edges of utensil-wash counters next to high fixtures or walls: coved up 10” and sloped back 1½” on 45º angle; 2½” slope where piping occurs. Turn down 1” at rear of splash and secure back splash to wall with 4” long 14-gauge stainless steel “Z” clip anchored to wall @ 36” o.c. Vacuum breaker pockets: 4” long square turnback sections, aligned with slope breakline.

C. Exposed Rear Splash: 16-gauge stainless steel finished panel from top of splash to bottom edge of rolled rim with welded vertical joint at end of splash and ½” turnback at bottom of panel. Secure panel with concealed attachment and installs bracing 24” o.c.

D. Cove all interior corners (horizontal/vertical) on ¾” radius and slope tables 1/8” per foot, maintaining level crown.

E. Brace utensil-wash counters with 1” x 4” 12-gauge stainless steel channels down centerline of top and between each pair of legs, with closed ends. Bracing: secured to underside of dishtable with ¼” studs welded 6” o.c. maximum, with chrome-plated washer, lock washer and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down on the channel-members, eliminating all vibration and “oil-canning.”

F. Integrally welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops: ground and polished to match top.

G. Extend underbracing members to wall, turn down 6” and anchor to wall when specified to be mounted on a leg/bracket assembly.

H. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8” stainless steel rod hose-hanger.

2.17 DOORS

A. 18-gauge x 1" stainless steel double pan-formed welded construction, insulated with 1" thick polyurethane boards. Seal perimeter joint of pans. Offset lower horizontal framing member of Closed Base Body to align flush access door with bottom of Body.

B. Channel-formed full-length horizontal recessed pull: ¾" turndown at front and ends with ½" tight hem. Front edge of pull: flush with face of door. Recess behind pull: sloped up on 60o angle and terminated 1" below bottom edge of pull.

C. Door Hardware:
   1. Two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge location).
   2. Component Hardware Model No. 35-2000 Concealed Magnetic Catch.
   3. Component Hardware Model No. D30-4780 lock in upper free corner of door.

D. Louvered opening: cutout opening size as indicated, turn in 1" and weld. All corners: ground and polished.
   1. Full-height 18-gauge stainless steel louver with 1" vanes at 45º, ½" spacing. Perimeter channel-formed frame: 1½" x 1". 45º x 1" x ½" x opening width plus ½" 18-gauge stainless steel louver.
   2. Tack weld tab of louver flange to back panel of door.

E. Drain handle opening: 6" diameter hole through double pan to accommodate Cambro Model No. PSB-6 Bowl.
   1. Secure bowl to door panel with clear silicone.
   2. Omit bottom of bowl. Dress raw edges of opening for passage of drain handle.
   3. Exposed insulation at penetration of door pan: painted black.

F. Sliding Doors: fabricate same as Paragraph "A."
   1. Aluminum Sliding Door Track: Component Hardware Model No. B57-0000 Series, length as required. Secure to angle frame at top of underside.
   2. Front/rear door sheaves: stainless steel ¾" side mounted door hangers; two (2) required per door.
   3. Recessed Vertical Pull at Upper Corner of Door: Component Hardware Model No. P63-1012.
   4. By-Passing Door Guides secured to bottom shelf: Component Hardware Model No. B62-1093.
   5. Door Stop at bottom edge of door: Component Hardware Model No. B60-1086.

G. Offset lower horizontal framing member of Closed Base Body/utility compressor compartment to align door flush with bottom of Body.

2.18 CLOSED BASE BODIES

A. Frame: rigid-welded 1½" x 1½" x 1/8" galvanized steel angle forming a continuous structure around the top and bottom perimeters of the fixture, a post at each corner, studs spaced 48" o.c. maximum. Top of frame is cross-braced with 1½" angles, 2'-0" o.c. maximum.

B. 18-gauge stainless steel panels and trim with concealed attachment. All seams: welded, ground and polished.

C. Exposed Vertical Corners: rounded on ¾" radius. Closed Base Bodies adjacent to walls or fixtures: square corners.

D. Vertical and horizontal channel members at shelf interior or drawer enclosures, such as corners and center mullions: closed and sealed

E. Closed Base Bodies set on finished masonry platforms: closed and caulked at underside of equipment overhang and bolted to platform. Body overhang of platform: 1" at free ends 2" at front and exposed rear sides.

F. Closed Base Bodies not set on platform: Component Hardware Model No. A54-2-6, 6" legs spaced 5'-0" o.c. maximum.

2.19 COMPRESSOR COMPARTMENTS

A. Same material as Closed Base Bodies with back and end partitions; omit bottoms only.

B. 10-gauge steel slide out support: channel frame on full extension slides with 125 lb. minimum capacity secured to fixture frame with anti-vibration mountings for maximum sound deadening. Closed Base Body on solid platform: front-to-back slide out support channels set 4" above bottom for air circulation.

C. Access Door: 18-gauge stainless steel double-pan type with channel formed horizontal recessed pull full length of top (similar profile as Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turndown at front and face of door. Recess behind pull slopes up on 60o angle, terminating 1" below bottom edge of pull. Offset lower horizontal framing member of Closed Base Body to align flush access door with bottom of body. Door hardware: two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and Component Hardware Model No. 35-2000 concealed magnetic catch.

D. Access Doors Louver: full-height, with 1½" x 1" x 18-gauge stainless steel channel-formed frame with welded corners. 18-gauge stainless steel louver. Submit sample of design for approval.

2.20 UTILITY COMPARTMENTS

A. Closed Base Bodies or Pedestal Supports: fitted with utility compartments wherever piping or wiring is required in/on the fixture.

B. Same material as Closed Base Bodies with full-height back and end partitions. Omit bottoms except at hose-reel locations.

C. Access Doors: 18-gauge stainless steel double-pan type with channel formed horizontal recessed pull full-length of top (similar profile to Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turn down at front of door, recess behind pull slopes up on 60o angle, terminating 1" below bottom edge of pull. Offset the lower horizontal framing member of the Closed Base Fixture to permit flush alignment of door with face and bottom edge of body. Door hardware: two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and one Component Hardware Model No. 35-2000 concealed magnetic catch.

D. No shelves of Closed Base Fixtures are to be penetrated.

2.21 UTENSIL RACKS

A. Rack: ¼" x 2" 300 series stainless steel flat bar with No. 4 finish, fully welded and formed to match shape shown on drawings. Lowest band: 7-6 aff, unless otherwise indicated.

B. Ceiling Mount Supports: 1-5/8" diameter 16-gauge stainless steel tubing from band to 18" above ceiling. Anti-sway bracing above ceiling: 1½" unistrut members. Tubing penetrations at ceiling: Component Hardware Model No. A16-0206 stainless steel gussets.

C. Table Mount Supports: 1-5/8" diameter 16-gauge stainless steel tubing extended thru counter top. Secure to closed base framing or crossrail/undershelf on open base fixture. Tubing penetrations of counter tops: integrally welded stainless steel inverted gusset.

D. Utensil Rack Hooks: Component Hardware Model No. J77-4401 stainless steel hooks spaced 8" o.c. maximum.

E. Electrical Receptacle: NEMA No. 5-20-R or as noted. Mount in fully welded 3½" x 5½" x 3" 14-gauge stainless steel enclosure with ½" radius corners. Stainless steel cover plate to fit specified receptacle. Pre-wire thru tubular support for final connection above ceiling by Division 26.

2.22 CASHIER / SERVING COUNTERS

A. Exterior Body Panels when specified: ¾" thick marine grade hardwood plywood with plastic laminate or solid polymer in Architect's selection of color/pattern at all exposed surfaces; backing sheet where concealed.

B. Position, size and finish horizontal or vertical reveal as directed by Architect.

C. Secure panels to counter body framing in concealed manner. Install removable panels with "Z" clips overlapping body framing members.

D. Hinged doors in exterior body panel(s): Grass Model No. 1200VZ or 1200VZ8 self-closing hinges. Three (3) required per door; Grass Model No. G/HRZ base plate at each hinge; Ives Model No. TM820 concealed push latch at each door. Confirm Model No. and provide samples with submittal.

E. Cashier counter to have 16-gauge s/s intermediate shelf, turned down 1 1/2" with tight hem at front. Cove up 2" at rear and sides. Brace undershelf with 1" x 4" 14-gauge stainless steel channel at longitudinal centerline. Provide outlet for power/data within body located above intermediate shelf.

2.23 OPEN BASE STRUCTURES

A. 1-5/8" o.d. x 16-gauge seamless stainless-steel tubing legs beveled at bottom. 1¼" o.d. crossrails fully-welded (360o smooth and polished) to legs at 10" aff, o.c.

B. Top of Leg: inserted in Component Hardware Model No. A20-0206 gusset fully-welded to table frame or sink bottom.

C. Bullet Foot: Component Hardware Model No. A10-0851.

D. Freestanding fixtures requiring utility connections: Component Hardware Model No. A10-0854 flanged feet at the fixture corners, anchored to floor with non-corrosive bolts.

E. Table Bases: maximum leg spacing of 6'-0" o.c.; dishtable and utensil wash counter bases at 5'-0" o.c.

F. Open Base equipment specified to be supported by brackets at the rear side only (not completely cantilevered): tubular legs at front side only with Component Hardware Model No. A10-0854 flanged feet anchored to floor with non-corrosive bolts. Front-to-back crossrail: fitted into Component Hardware Model No. A20-0406 circular gusset secured to wall with non-corrosive bolts.

2.24 UNDERSHELVES

A. Open Base Structures: 16-gauge stainless steel turned down 1½" with tight hem at bottom. Notch all corners to fit tubular legs and weld from underside to completely fill gap; grind and polish. Cove up 2" at rear or ends adjacent to wall, columns, refrigerators, etc. The turn up at freestanding fixtures is to be hemmed tight to bottom of turndown. Brace undershelf with 1" x 4" 14-gauge stainless steel channel at longitudinal centerline and at each intermediate pair of legs.

B. Open Base Structure specified to be supported by brackets at rear side only (not completely cantilevered): 16-gauge stainless steel turned down 1 ½" at free sides with tight hem at bottom edge. Notch all corners to fit tubular legs as required and weld from underside to completely fill gap; grind and polish. Cove up 2" at rear ends, as indicated. Fill gap at front to back rail, grind and polish. Brace undershelf with 1" x 4" x 1" 14-gauge stainless steel channel at longitudinal centerline between front to back rails.

C. Closed Base Fixtures: 16-gauge stainless steel turned down 1½" at front. Front edge of bottom shelf: turned back and sealed to finished masonry platform or boxed for leg application. Center shelf has ¾" tight hem.

1. Shelves: turn up square at ends (coved up at rear only) to the shelf above or counter top flanged out for attachment with no open spaces at interior.
2. All shelf partitions at exposed ends of cabinet bodies or interiors: free of exposed framing members.
3. Reinforce shelves with full-length 1" x 4" x 14-gauge stainless steel closed hat channel.
4. Unless otherwise noted, all closed base undershelves are to be 22" deep, clear.
5. Fully weld smooth and polish, the vertical seam of shelf turndown/turn up with face of body partition.
6. Seal the vertical seam of square turn-in at exposed interior of open shelf sections.

2.25 ANCHOR PLATES / WOOD GROUNDS

A. Behind finish surface wherever building wall, partitions or ceiling construction will not accommodate direct attachment of equipment such as over shelves, wall cabinets, hose reels, utensil racks, exhaust hoods, display cases, etc. Material and installation by General Contractor. Location and coordination with trades by Section 11 4000.

B. Anchor Plates: not less than 12" x 12" x ¼" thick steel, secured to the structure above or behind the finished surface, positioned at attachment points.

C. Wood Grounds: length required by fixture, component or device, 24" wide x ¾" thick plywood secured to partition system prior to gypsum board installation.

D. Above ceiling supports: structural shapes (4" x 8.0 lb. channel) suspended from structure. Maximum height 15'-0" aff. size: width of equipment x length of equipment plus 6'-0". Cross bracing at 6'-0" on center maximum.

2.26 OVERSHELVES

A. 16-gauge stainless steel with free edges turned down 1" with ½" tight hem at bottom. ¾" radius at free corners.

B. Turn up 2" raw at walls and sides with horizontal coved corner at rear. Round front corners of turn up on ¾" radius.

C. Where shelf width exceeds 12" width, reinforce with ½" x 4" x 14-gauge stainless steel closed hat channel full-length of shelf.

D. Wall-Mounted Shelves: 16-gauge stainless steel brackets 48" o.c. maximum, set in 6" from ends.

E. Freestanding Shelves: where splash is required at free over shelves, turn up square 2" at ends, cove up at rear and hem tight to lower edge of front turndown. Weld exposed corners.
   1. Freestanding over shelves: 16-gauge stainless steel cantilevered brackets at rear of table; double-cantilevered brackets at center of table. Posts for cantilevered over shelves are 1-5/8" o.d. x 16-gauge stainless steel secured to underframe, 4'-0" o.c. Ends of shelves: secured to adjacent wall/fixture or mounted on 1¼" diameter stainless steel posts.
   2. Freestanding over shelves not on cantilevered brackets: 1¼" o.d. x 16-gauge stainless steel posts, each pair at 4'-0" o.c., maximum.

F. Baker Table Over shelves: supported at 18" above top with 1¼" o.d. stainless steel tubular supports with channel shoe secured to risers.

G. Glass/Cup Rack Overshelf at Dishtables: 14-gauge stainless steel with 1½" deep "vee" trough at free long sides with 1" tight hem at inside of trough. Provide a ½" marine edge at free ends; 4" splash at wall. Suspend shelf at 18" above dishtable surface on posts/brackets anchored to dishtable frame/wall at rear; 1" o.d. stainless steel tubing supports from structure above ceiling at front edge, 60" o.c./each end.
   1. Install at both ends, ½" stainless steel drain-tube (connecting both vee-troughs) extended to dishtable surface through splash turnback.

2. Rack-rest: horizontal full-length 1-5/8" o.d. stainless steel tubing supported at 10" o.c. above shelf (8" o.c. for double service shelf) by 1¼" o.d. stainless steel tubing with closed ends. Support tubing: welded, ground and polished, spaced 60" o.c.
3. Rack-rest supports to wall: 4" x 4" x 10-gauge stainless steel flange plates welded to support tubing. Anchor flanged plates to blocking ground with non-corrosive bolts.

2.27 DRAIN TRENCH LINER / GRATING

A. Liners: 14-gauge stainless steel in sizes as indicated.

B. Interior of liners: 6" deep with all interior corners (horizontal/vertical) coved on ¾" radius; sloped and scored 1" to integrally welded Component Hardware Model No. D34-Y011 basket drain assemblies @ 48" o.c., fitted with 6" long welded tailpiece. Stainless steel safety chain: connected to basket strainer assembly and top of liner wall.

C. Liners: 1" wide perimeter shoulder at the top, turned up flush with finished floor, tight-hemmed back down to the shoulder level and flanged out 2" for attachment to the slab.

D. Underside of sloping portion of liner: 2" long "Z" clips.

E. Grating: Irving Subway Grating Type DD removable fiberglass grating.
1. 1½" x 3/16" bearing bars.
2. Full perimeter frame, section quantities and sizes indicated.
3. Maximum of 2'-0" sections.
4. Grating to be equal sizes.

2.28 WALL PANELS

A. Wall Panels: 18-gauge stainless steel, double pan-formed ½" thick with internal stiffener members. Fill with USDA approved thermal insulation, full height and width of panels, attach to interior with mastic. Maximum allowable temperature at rear side of panel: 120oF.
1. Height of panels as required: top of tile base to underside of hood, top of tile base to top cap of stub wall or top of splash to underside of hood.
2. Level and square lower edge and sides.
3. Butt joint all panels.

2.29 EXHAUST HOOD (Surface - Mounted Condensate)

A. Hoods: size/shape as indicated: 18" high at interior.

B. Body: 16-gauge stainless steel, with all seams welded, ground and polished.

C. Continuous condensate trough at perimeter: 3" x 1".

D. Frame top of hood with 1½" angle iron assembly and suspend from structure above ceiling by ½" diameter steel rods, drawn tight against finished ceiling surface.

E. Duct opening/collar as specified with stainless steel louvered grille over opening.

F. Div. 22 to extend drain line to floor sink. Drain line to be silver painted.

G. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

2.30 EXHAUST HOOD (UNLESS SPECIFIED OTHERWISE)

A. Exhaust to be provided to meet local jurisdiction code requirements. Kitchen Equipment Contractor to verify code requirements and coordinate with Division 23.

B. Install fire suppression system(s) in all ventilators, specified in this section. Install in accordance with manufacturer's recommendations and applicable codes or standards. Submit installation certification form to Architect.

C. Locate chemical cylinders as indicated on drawings and install piping to exhaust hood(s) in totally-concealed manner. Set cylinders and cabinets at 7"-0" clear aff unless noted otherwise. Provide polished chrome plated tubing piping/fittings, where exposed at cylinder location and at interior of exhaust ventilator. Exposed pipe threads in/above food zone not allowed. Submit schematic diagram of installation and confirm critical distances from cylinders to nozzles.

D. Remote manual release located in path of egress from protected exhaust hood area. Kitchen Equipment Contractor to coordinate location with local Fire Marshal requirements prior to submittal review. All conduits to be recessed within wall, SURFACE MOUNTING WILL NOT BE ACCEPTED.

E. Provide one (1) hand held Type 'K' 6-liter fire extinguisher per Ansul system, surface wall mounted.

F. Required quantity and sizes of mechanically-operated gas valves.

G. Confirm interconnection of all equipment as required to insure exhaust hood and fire suppression systems are completely operational and meet local jurisdiction code requirements.

H. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

I. Provide appropriate quantity of fire suppression system as required by local jurisdiction code requirements.

2.31 HIGHLIGHTING

A. Polish the following vertical surfaces to a No. 8 finish:
   1. Serving and display shelf turndowns.
   2. Conveyor and dish/tray deposit station turndowns/frame.
   3. Trayslide turndowns.

2.32 SHOP / FIELD JOINTS

A. Field joints: least possible number, used only when equipment size must be limited for access into building or interior space.

B. Stainless steel tops (including edges and splashes): fully welded, ground and polished to match adjacent surface.

C. Vertical field joints of fixture backsplashes that are inaccessible from the back: terminate 1” above the horizontal coved corner. The remaining height of field joint: hairline butt joint with offset draw-angle behind. All horizontal/vertical draw-joints: located and noted on shop drawings. Hairline butt joint: 1½” x 1½” x 1/8” steel angles welded to back/underside of countertop/shelf. Offset angle beyond joining metal edge ½” (min.) to provide flat backing surface for joint with angle of other joining metal edge, set for ½” space between vertical legs of angles. Bolt sections together with 5/16” machine bolts, lock washers, acorn head cap nuts, set 3” o.c.

D. Closed Base Bodies: draw-type with hairline seam fully field-welded.

E. Millwork: plastic laminated material joints shall be doweled, glued and draw-bolted with fasteners.

F. Solid Polymer: surfaces drawn tight, filled, sanded and finished to match adjacent surface.

2.33 PREFABRICATED COLD STORAGE ASSEMBLIES

A. Assembly to be FACTORY INSTALLED. Certificate or letter from the Manufacturer stating they will be the only installer will be required along with the Shop Drawings.

B. Sectional Assemblies: size/shape indicated on drawings; 8'-6" aff unless otherwise specified. Door locations/size: exactly as shown.

C. Sandwich Panel Insulation: Class 1 Urethane with vapor barrier, 4" thickness with mature "U" factor of .030 or lower.

D. Wherever compartment dimension exceeds clear-span ability of ceiling panels, provide I-beam support on exterior of ceiling or spline-hangers. Install ½" diameter steel rods through beam/hangers and secure to structure above. Beams or posts within compartments are not acceptable.

E. Reinforce prefabricated wall panels to rigid-support the door assemblies. All door jambs: furnished with replaceable full-perimeter thermostatically-controlled heater cable. Install 2" x 4" 16-gauge stainless steel hat-channel full-width of jamb with 1/8" stainless steel removable flush sill, secured with stainless steel screws and sealed watertight to channel.

F. 8-1/2" Recessed Factory Floor Assemblies:
1. 6 mil polyethylene sheets in slab recess with all joints lapped 6 inches and sealed to form a watertight seal seal.
2. Level and square prefabricated perimeter and partition wall panels, anchored to slab recess. Protect exposed surface of panels.
3. 4" manufacturer's floor with 17" high screed wall base walls.
4. 15# felt slip sheet over insulation with 6" lapped joints flashed up the height of finished floor base.
5. 1/2" sand leveling bed by G.C.
6. Concrete flooring and tile over insulation by Divisions 03/09.

G. 4" Recessed Exposed Factory Floor Assemblies:
1. 6 mil polyethylene sheets in slab recess with all joints lapped 6 inches and sealed to form a watertight seal.
2. Level and square prefabricated perimeter and partition wall panels, anchored to slab recess. Protect exposed surface of panels.
3. 4" commercial grade manufacturer's durafloor with diamond treadplate surface and marine grade plywood subfloor.
4. 15# felt slip sheet over insulation with 6" lapped joints flashed up the height of finished floor base.
5. 1/2" sand leveling bed by G.C.

H. Surface Mounted Factory Floor Assemblies:
1. 4" commercial grade manufacturer's durafloor with diamond treadplate surface and marine grade plywood subfloor.
2. 36" re-enforced diamond treadplate internal ramp.
3. 10-gauge stainless steel threshold to provide smooth transition to interior walk-in floor.

I. Modularm Model No. 75LC temperature monitor/alarm with sensor and probe-cord length required to extend from exterior front of assembly to a mounting position of the sensor within evaporator return air-stream. System to include built in panic alarm. System to be interconnected to building's alarm system by Division 27.

J. LED surface-mounted light fixture, in quantity/arrangement shown on drawings. Light fixtures wired to interior and exterior temperature control panel. Light fixtures to be provided by Section 11 40 00 and installed by Division 26.

K. Penetrations of Panels: To be sealed by factory installer with Dow Corning 3-6548 silicone RTV foam, full-depth of panel. Trim excess flush.

L. Install closure panels and/or trim strips to building walls and ceiling with concealed attachment. Closure material: same as wall panels unless noted otherwise.

M. Compartment Entrance Doors: 36" x 78" nominal clearance unless otherwise noted.
1. Mount hinged doors on three Kason Model No. 1346; polished chrome plated nylon cam-lift hinges.
2. Swing doors as indicated on drawings.
3. Defrost heater: thermostatically controlled and replaceable at full-perimeter of all doors, except when using clear Lexan doors (in addition to door jambs). Defrost heaters to be wired for continuous service.
4. 36" high x full-length diamond aluminum treadplate at front and rear of all hinged doors.
5. 12" x 2" engraved phenolic plastic compartment identification sign in Architect's color selection with 1" letters, mounted above door window.
6. 14" x 24" four-panel glass view window with heater and molded non-metallic inner and outer frame. Heater to be wired for continuous service.
7. Padlock/key provisions in door latch with interior safety release.
8. Provide one (1) heated pressure relief port for each cooler/freezer section with separate dedicated electrical circuits. Heated pressure relief ports in freezers to be wired for continuous service. Heated pressure relief port for freezer to be located on common wall of cooler/freezer assembly, unless specified otherwise.

N. Provide refrigeration calculations and refrigeration alarm to meet local jurisdiction code requirements.

O. Manufacturer to provide written report upon completion of installation and start-up confirming that cold storage assembly is installed within manufactures requirements.

2.34 COLD STORAGE REFRIGERATION SYSTEMS

A. Unit Coolers: specified quantity and model, ceiling-hung by ½" o.d. nylon bolts with stainless steel washers and nuts. Insert hanger bolts through plastic sleeve and seal penetration airtight.
1. Unit cooler drain fittings: positioned as indicated on drawings. Installation of cast tee-fittings on drain pan outlet with union and cleanout plug and extension of 1" Type K copper drain line through wall panel to air-gap fitting or floor drain under this Section.
2. Slope drain line ½" per foot, trap at exterior of assembly and turn down into drain. Manifold drain lines of adjacent compartments wherever possible.
3. Install drain line plastic sleeve through compartment wall, seal around drain line and install stainless steel escutcheon with setscrews.
4. Electric drain line heater cable (self-regulating 7 watts): on all unit coolers operating below 36oF., installed from coil drain line fitting to wall penetration under this Section. Heater cables: minimum rating of 15 watts/lineal foot, 208 volts, single phase. Wrap drain line with maximum 2" loop spacing and interwire to unit cooler for continuous operation.
5. Mounted, pre-piped and pre-wired evaporator components:
   a. Sporlan thermostatic expansion valve with external equalizer.
   b. Shut-off valve at evaporator suction and liquid lines.
   c. Sporlan "Catch-All" refrigerant filter/dehydrator on liquid line.
   d. White Rogers 1609-101 adjustable thermostat with remote bulb positioned in return air-stream of evaporator.
   e. Electrical disconnect switch in NEMA 4 enclosure.

B. Refrigerant System Installation.
1. Refrigerant Lines; Type "L" hard copper tubing. Fittings: wrought copper or brass designed for use with high temperature solder. Piping joints: made with silver solder (Sil-Fos). Piping: properly suspended from and anchored to the structure with adjustable hangers 6' o.c. maximum. Suction lines: sized to have maximum pressure drop of two pounds in medium temperature systems; one pound in low temperature system. Liquid lines: sized to give maximum pressure to prevent trapping of oil. Insulation on all suction lines: Armaflex insulation by Armstrong. ¾" thick at medium temp 1" thick at low-temp.

Refrigerant lines in PVC or EMT conduit: sealed at both ends with Dow Corning 3-6548 silicone RTV foam. Exterior Refrigerant Lines to be wrapped by refrigeration system installer in self-fastening jacket of Type 3003-H14 aluminum alloy 0.016-inch thick. Provide aluminum strapping and seals for applying aluminum jacket and covers according to manufacturer's recommendations to provide completely weather-tight covering.

C. Evacuation and Charging.
1. After completion of the pressure test, the system shall be evacuated using an approved auxiliary vacuum pump. Connections for evacuation: in accordance with manufacturer's recommendations.
2. Charging subsequent to the initial charge, which is contained in the condensing unit (R22 Refrigerant for medium and high temp units, R404A - Non- CFC Ozone Depletion Refrigerant on low temp units): given through the charging valve in the high side passing all of the liquid refrigerant through a charging dehydrator. All charging lines and gauges: purged of air prior to connection with system. Refrigerant: unused and shall be delivered in clean containers. After the system is fully charged: start and place in full operation.

2.35 PRE-APPROVED KITCHEN SUPPLIERS

A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor's Bid.

B. Any supplier requesting for inclusion within this bid will be required to submit AIA form 305 minimum 14 days prior to bid date for review, or as required by Architect.
1. Ed Don & Company, 3501 Plano Parkway, The Colony, Texas 75056, Mr. Scott Jost, Phone: (972) 624-7460, Fax: (972) 624-7762, E-mail: scottjost@don.com
2. 2. Pasco Brokerage, Inc., Mr. Bill Hollon, 2929 Custer Road, Suite 301 Plano, Texas 75075, Phone (972) 596-3350, Fax: (972) 596-2817, Email: bhollon@pascoinc.com
3. Supreme Fixture Co. Inc., Mr. Tim Hampel, 11900 Vinny Ridge Road, P.O. Box 193655 Little Rock, Arkansas 72219, Phone (501) 455-2552, Fax: (501) 455-0802, Email: tim@supremefixture.com
4. Texas Metal Equipment Company, Mr. Ryan Williamson, 6707 Mayard Rd. Houston, Texas 77041 Phone: (469) 585-4665, Fax: (713) 466-0166

2.36 PRE-APPROVED STAINLESS-STEEL FABRICATION SUPPLIERS

A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor's Bid.

B. Any supplier requesting for inclusion within this bid will be required to submit AIA form 305 minimum 14 days prior to bid date for review, or as required by Architect.
1. Keas Stainless Steel Fabricators, Inc., Mr. Don Keas, P.O. Box 15747, Del City, Oklahoma, 73155-5747, Phone: 405-232-0869, Fax: 405-232-2898.
2. Custom Kitchen Equipment Company, Mr. Glenn Redman, 2601 Wilson Road, Humble, Texas 77396, 281-446-8187, Fax: 281-446-8180.
3. Texas Metal Equipment Company, Mr. Andrew Harman, 6707 Mayard, Houston, Texas 77041, 713-466-8722, Fax: 713-466-0166.
4. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, 832-767-5287
5. Jero Manufacturing Inc., Mr. John Pingleton, 5117 South 100th E Ave, Tulsa, Oklahoma 74145, Phone (918) 628-0230 Fax: (918)628-1603
6. Stainless Innovations, Mr. Randy Mulikin, 1110 Carnall, Fort Smith, Arkansas, 72901 Phone: (479) 73-1900.

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

A. Supervision: provide a competent foreman or supervisor who shall remain on the job during the entire installation.

B. Delivery: coordinate with progress of construction and Owner's operation schedules. Unless otherwise instructed and documented by Owner or General Contractor, the following procedures apply:
   1. Field-Assembled Fixed Equipment integrated into the structure (e.g., cold storage assemblies, exhaust hoods, drain trench/grate assemblies, conveyor systems, ceiling-mounted utensil racks, etc.) are to be sent to the job-site when directed by the General Contractor and installed/protected accordingly.
   2. All other Fixed Equipment: delivered after completion of work on adjacent finished ceilings, lighting, finished floor and wall systems, including painting.
   3. Major Movable Equipment: delivered when possible to inventory in secured area for interim job-site storage or, if secured area is not available, when fixed equipment installation/clean-up has been completed.
   4. Minor appliances and loose items (e.g., pans, covers, flatware containers, etc.) delivered only when Owner is prepared to receive and inventory such items.

C. Installation: performed by manufacturer of custom fabricated fixtures.
   1. Assemble, square, level and make ready all items for the final utilities' connections.
   2. Cut neatly around obstructions to provide sanitary conditions.
   3. Where gaps of ¼" or less occur adjacent to or between equipment, insert rope backing and smoothly-applied General Electric construction sealant Series SE-1200 silicone mastic (white color). Mask both sides of gap for neat application of sealant and remove excess. If space exceeds ¼", neatly install 18-gauge stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement or "Z" clips wherever possible to secure stainless steel trim. Exposed edges or corners of trim: eased and smooth.
   4. Refrigeration coil drain line runs to indirect drain connection greater than 2" from face of wall or panel: either of the following field procedures.
      a. Trench the floor and provide 6" wide x 2" deep 16-gauge stainless steel sloping (-1" to -2") trough from face of cooler/freezer wall to body of floor sink/floor drain. Trough: turned up 4" at wall; ¾" flange with ½" turndown at both long sides. Set trough in waterproof mastic and seal 1" o.d. drain tube penetration into floor sink/floor drain at -2½" bff. Patch the floor to match adjacent material/surface.
      b. Provide 12" x 6" x 2" deep 16-gauge stainless steel condensate pan mounted to cooler/freezer wall at 6" aff clear. Trench the floor and install 1" o.d. drain line from bottom of pan to body of floor sink/drain. Slope drain line ¼" per foot and seal all connections watertight. Patch the floor to match adjacent material/surface.

D. Protection of Work:
   1. Fabricated fixtures: fiberboard or plywood taped to tops and exposed body panels/components.
   2. Manufactured Equipment: fiberboard or plywood taped as required by equipment shape and installation-access requirements.
   3. Prohibited use of equipment: tool and materials storage, workbench, scaffold, stacking area, etc.
   4. Damaged Equipment: immediately documented and submitted to Owner with Contractor's recommendation of action for repair or replacement and its impact on the Project Schedule and Contract Amount, if any.

3.2 CLEAN AND ADJUST

A. Clean up and remove from the job site, all debris resulting from this Work as the installation progresses.

B. Thoroughly clean and polish interior/exterior of all Foodservice Equipment, prior to demonstration and final observation, ready for Owner's use.

C. Lubricate and adjust drawer slides, hinges, casters.

D. Adjust pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, exhaust hood grilles, etc.

E. Clean or replace faucet aerators, line strainers.

F. Touch-up damage to painted finishes.

G. Start up and check operation of all refrigeration systems for at least 72 hours prior to acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

A. Carefully test, adjust and regulate all equipment in accordance with the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments and performance are in full compliance.

B. Provide the Owner or Foodservice Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance. Coordinate and schedule selected items of equipment and attendees with Owner at least two weeks in advance of demonstration periods.

3.4 FINAL OBSERVATION

A. Final observation will be made when the Contractor will certify that he has completed his work, made a thorough review of the installation/operation of each item in the contract and found it to be in compliance with the Construction Documents.

B. Repetitive final observations (more than two) and all costs associated thereto which may be incurred due to the Contractor's failure to comply with the requirements of this Article will be invoiced to this Contractor on a $70.00/hr. and expense basis.

PART 4 - EQUIPMENT SCHEDULE

4.1 REGULARLY-MANUFACTURED EQUIPMENT/COMPONENTS: standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.

4.2 FABRICATED AND FIELD-ASSEMBLED EQUIPMENT: Arrangement and configuration as shown on Plans, Elevations and Detail Drawings.

4.3 REFER TO DRAWINGS for unit quantities and electrical or mechanical provisions required, including manufacturer's optional voltages, wattages, burner capacities, etc.

4.4 REFER TO PART 2 - PRODUCTS for accessories, fittings, requirements and procedures related to the listed buy-out and fabricated equipment.

4.5 ALTERNATE MANUFACTURER REQUIREMENTS: A specific product manufactured by the following listed pre-approved equals are acceptable only if the specific product can evidence compliance with the specified item and the contract documents:

4.6 RE-USED EXISTING EQUIPMENT

A. Existing equipment scheduled for re-use is to be inventoried and documented that equipment is in operating condition once Kitchen Contractor has taken ownership.

B. Provide pictures of all equipment once inventoried and issued to the architect to ensure that equipment has not been damaged.

C. Verify locations of all equipment with owner.

D. Existing equipment that is to be reused may be missing parts or accessories for proper and complete operation. Submit report listing all items with pricing for approval to allow complete installation.

E. Utility disconnection and re-connection: under Divisions 22 and 26. Kitchen Contractor to verify utility requirements of existing equipment and coordinate with Kitchen Consultant as required. All utilities not scheduled for re-use to be capped and covered by required disciplines.

F. Disassembly, removal, transportation and relocation: under this Section and scheduled with General Contractor. Owner's representative must be present, coordinate date / time with owner.

G. Thoroughly clean inside and out prior to relocation.

H. Review functional parts (e.g., doors, controls, heating elements, compressors, etc.) and submit report of required repairs and estimate of cost. Any finishes or equipment damaged due to construction to be repaired as required.

I. Existing equipment not scheduled for reuse is to be carefully removed/relocated by the Kitchen Contractor per the Owner's direction. Kitchen Contractor to coordinate date / time with General Contractor and Owner.

J. Removal or replacement of existing equipment is to be scheduled for times of least interruption and inconvenience to the foodservice operation. Submit proposed schedule of time frame, task sequence and operation for approval prior to starting work.

K. Kitchen Contractor to verify size and shape for all existing equipment being re-used and coordinate with Foodservice Consultant as required.

L. Any modification(s) required/desired for re-used existing equipment to be verified by the Kitchen Contractor. All modifications must be approved by the Owner and Foodservice Consultant prior to the modifications being made.

M. The KEC is to verify and coordinate all of the utility requirements with the construction documents as required. Refer to the general specifications re: conflicts.

4.7 FOODSERVICE EQUIPMENT

A. All equipment to have a performance check from factory authorized personnel. Warranties will begin on the day of performance check.

BRYSON ES:

ITEM NO. 113 COOLER STORAGE ASSEMBLY QUANTITY 1

Manufacturer:	Existing
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Refer to General Specs 4.6 for re-used and exiting equipment.

ITEM NO. 186 PASS-THRU HEATED CABINET- 1DR QUANTITY 2

Manufacturer:	Winston
Model:	CAC522
Size and Shape:	Refer to drawings
Alternate:	---

1. Anodized aluminum interior and S/S exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. Universal 18" x 26" pan files on 4" centers in all sections.
6. 6" high adjustable S/S legs.
7. Furnish start-up and three (3) years repair service, including parts and labor.
8. Controls mounted on kitchen side.
9. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
10. Stainless steel removable trim located between wall and top of cabinet.
11. Half height doors hinged as per plan. Stainless doors located on kitchen side and server side.
12. Re-hinging feature.

1. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 188 PASS-THRU REFRIGERATOR - 1DR QUANTITY 2

Manufacturer:	Traulsen
Model:	AHT-132WPUT
Size and Shape:	Refer to drawings
Alternate:	---

13. Anodized aluminum interior and S/S exterior.
14. Interior lights with bulbs.
15. Exterior digital thermometer.
16. Locking hardware.
17. Universal 18" x 26" and 12" x 20" pan files on 4" centers in all sections.
18. 6" high adjustable S/S legs.
19. Furnish start-up and three (3) years repair service, including parts and labor.
20. Controls mounted on kitchen side.
21. Five (5) Year compressor warranty.
22. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
23. Stainless steel removable trim located between wall and top of cabinet.
24. Full height doors hinged as per plan. Stainless doors located on kitchen and server side.
25. Re-hinging feature.
26. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 201 SERVING COUNTER QUANTITY 1

Manufacturer:	Counter Craft
Model:	---
Size and Shape:	Refer to drawings
Alternate:	Mod-U-Serve

1. Semi open base construction. All electrical conduit and plumbing to be located within utility chase as required. Utility chase to be fully accessible from operator side of counter with removable stainless-steel panels.
2. Counter tops located 34" A.F.F. Stainless steel construction 14-gauge, type 304 series with 2" turndowns on all sides.
3. Group "E" Corian tray slide at 30" A.F.F. with polished s/s buttons and under mounted LED lighting. Tray slide to be supported with finished plywood with white melamine at exposed areas. Tray slide brackets to be fully welded to angle iron frame.
4. Sneeze guards provided with adjustable front pivoted tempered glass and tempered glass over-shelf. 1" OD round, fully polished s/s posts penetrating counter top and anchored to counter framing. Top and Front glass to be 3/8" tempered glass. NSF approved side-panels to be 1/4" tempered glass.
5. **Two (2) Hot Food Modules:**
    a. Stainless steel construction. Counter height to be 34" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
    b. Five (5) pan capacity 12" x 20" individual drop-in, 1000-watt wells with infinite switch controls. Wells provided with 1" recess to accommodate 18" x 26" sheet pans. Individual drains valves provided per hot food well.
    c. S/S work shelf on drop-down brackets
    d. Deck mount single pantry fill faucet T&S Model no. B-0208.
    e. Adjustable sneeze guard with full height glass, heat strip and LED light provided over hot food wells.
    f. Daisy chain electrical connection to interconnect box located in hot food counter.
    g. Raised s/s panels with plastic laminate to be selected by District.

h. Two (2) angled steel housings to accommodate one (1) each 1/2 shotgun stainless steel pans per housing.

6. **Two (2) Frost Top Modules:**
   a. S/S construction 30" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
   b. Corian tray slide with LED lights fixed on brackets to be 30" A.F.F.
   c. Single recessed frost top. To accommodate two (2) 18" x 26" pan capacity, mechanically cooled, 1/2" recessed, stainless steel frost top, for pre-packed products.
   d. Self-contained condensing unit raised tier to be on 9° incline, pitched toward students.
   e. adjustable sneeze guard with half-height glass and LED light provided over frost tops.
   f. Daisy chain electrical connection to interconnect box located in hot food counter.
   g. Raised stainless steel panels with plastic laminate to be selected by district.
7. **One (1) Cashier and Salad Bar Module:**
   a. Closed base stainless steel construction. Counter height at salad bar to be 30" A.F.F. Counter height at cashier stand to be 34" A.F.F. Stainless steel kick plate.
   b. Electrical cord reel and wrap provided for roll-out salad bar.
   c. Three (3) 12" x 20" pan capacity, mechanically cooled stainless-steel cold pans, 6" deep with self-contained condensing unit. RPI glass colored cold pan insets. Verify color selection with architect and owner.
   d. Drop-in ice cream dispenser located per drawings.
   e. Ten (10) fixed poly casters with 6-1/4" load height with 1/4" tall spacer plates.
   f. Corian tray slide with LED lights on fixed brackets to be 30" A.F.F.
   g. Single tier stainless steel overhead slanted snack rack with 1" OD round posts, anchored to counter frame provided. LED light provided on each tier of snack rack underside for ice cream merchandising.
8. Two (2) 18-gauge type 304 series stainless steel cash drawer with extension slides, cylinder locks and 3" deep stainless-steel liner.
9. Two (2) grommeted holes for POS wires. POS to be provided by owners.
10. Two (2) data cables cable receptacles. Two (2) 120V, 15A, duplex receptacles prewired to cord and plug.
11. Daisy chain electrical connection to interconnect box located in hot food counter. Stainless steel intermediate and under-shelves where possible.
12. Provide two (2) convenience outlets per control panel.
13. Plastic laminate lined knee recess by serving line manufacturer. Liner to have LED light.
14. Counters to be factory installed, manufacturer to provide floor template and coordinate with MEP and any furr down requirements.
15. Manufacturers are to bid all items per specifications, deviations from the specified manufacturers or fabrication will not be accepted.
16. Counter template to coordinate with servery walls, furr downs, electrical and plumbing locations. KEC to coordinate installation and any site conditions with the Trade/General Contractor as required

ITEM NO. 214 CASH REGISTER QUANTITY 2

Manufacturer: Owner Furnished
Model:
Size and Shape: Refer to drawings
Alternate: ---

ITEM NO. 209 DROP FRONT MILK COOLER – 8 CASE QUANTITY 2

Manufacturer: Mod-U-Serve
Model: MCT-DM1
Size and Shape: Refer to drawings
Alternate: **---**

1. 18-gauge S/S fully welded liner.
2. 20-gauge S/S exterior.
3. Double pan insulated doors.

4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 8 case capacity.
11. Strip curtains.
12. Special Instruction: Coordinate location of electrical receptacle so as to not interfere with location of milk dispenser.

ITEM NO. 800 GRAPHICS PACAKGE QUANTITY 1 (LOT)

Manufacturer: The Bubble
Model: Custom
Size and Shape: Refer to drawings
Alternate:

1. Graphics package to include the following: Two (2) ceiling mounted soffits, and wall painting.
2. Verify color, size, and pattern with owner as required.
3. Provide wall painting as directed by architect and owner. Verify color selection with owner, provide chip samples for owner's review.
4. Provide two (2) ceiling mounted soffits, verify all graphics with owner. Suspend from the ceiling and provide additional support as required.
5. KEC to coordinate installation with the any cameras and light fixtures; the graphics should not block any of the camera views.
6. Contractor to properly remove or protect all equipment as required.
7. Graphics package to meet all district standards.

ITEM NO. 801 UTILITY CHASE QUANTITY 1

Manufacturer: Custom Fabrication
Model:
Size and Shape: Refer to drawings
Alternate: Mod-U-Serve

1. 18-guage s/s utility chases located per drawings.
2. Chase to be pre-piped to accommodate water lines at entrance/exit.
3. Pre-wire for single point connection above ceiling.
4. Water-tight internal chase.
5. Single receptacle to accommodate single-point connection from counter.
6. Secure chase to floor and ceiling.

ITEM NO. 804 ICE CREAM DROP-IN CABINET QUANTITY 1

Manufacturer: LTI Serving Technology
Model: DI-2222-IC
Size and Shape: Refer to drawings
Alternate:

1. Locate per drawings.
2. Lid locking assembly.
3. Easy life see-thru lid.
4. Cord and plug assembly.
5. Two large compartments.
6. Two coated baskets.

ELKINS ES:

ITEM NO. 186 PASS-THRU HEATED CABINET- 1DR QUANTITY 2

Manufacturer:	Winston
Model:	CAC522
Size and Shape:	Refer to drawings
Alternate:	---

1. Anodized aluminum interior and S/S exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. Universal 18" x 26" pan files on 4" centers in all sections.
6. 6" high adjustable S/S legs.
7. Furnish start-up and three (3) years repair service, including parts and labor.
8. Controls mounted on kitchen side.
9. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
10. Stainless steel removable trim located between wall and top of cabinet.
11. Half height doors hinged as per plan. Stainless doors located on kitchen side and server side.
12. Re-hinging feature.
13. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 188 PASS-THRU REFRIGERATOR - 1DR QUANTITY 2

Manufacturer:	Traulsen
Model:	AHT-132WPUT
Size and Shape:	Refer to drawings
Alternate:	---

1. Anodized aluminum interior and S/S exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. Universal 18" x 26" and 12" x 20" pan files on 4" centers in all sections.
6. 6" high adjustable S/S legs.
7. Furnish start-up and three (3) years repair service, including parts and labor.
8. Controls mounted on kitchen side.
9. Five (5) Year compressor warranty.
10. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
11. Stainless steel removable trim located between wall and top of cabinet.
12. Full height doors hinged as per plan. Stainless doors located on kitchen and server side.
13. Re-hinging feature.
14. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 201 SERVING COUNTER QUANTITY 1

Manufacturer:	Counter Craft
Model:	---
Size and Shape:	Refer to drawings
Alternate:	Mod-U-Serve

1. Semi open base construction. All electrical conduit and plumbing to be located within utility chase as required. Utility chase to be fully accessible from operator side of counter with removable stainless-steel panels.

2. Counter tops located 34" A.F.F. Stainless steel construction 14-gauge, type 304 series with 2" turndowns on all sides.
3. Group "E" Corian tray slide at 30" A.F.F. with polished s/s buttons and under mounted LED lighting. Tray slide to be supported with finished plywood with white melamine at exposed areas. Tray slide brackets to be fully welded to angle iron frame.
4. Sneeze guards provided with adjustable front pivoted tempered glass and tempered glass over-shelf. 1" OD round, fully polished s/s posts penetrating counter top and anchored to counter framing. Top and Front glass to be 3/8" tempered glass. NSF approved side-panels to be 1/4" tempered glass.
5. **Two (2) Hot Food Modules:**
    a. Stainless steel construction. Counter height to be 34" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
    b. Five (5) pan capacity 12" x 20" individual drop-in, 1000-watt wells with infinite switch controls. Wells provided with 1" recess to accommodate 18" x 26" sheet pans. Individual drains valves provided per hot food well.
    c. S/S work shelf on drop-down brackets
    d. Deck mount single pantry fill faucet T&S Model no. B-0208.
    e. Adjustable sneeze guard with full height glass, heat strip and LED light provided over hot food wells.
    f. Daisy chain electrical connection to interconnect box located in hot food counter.
    g. Raised s/s panels with plastic laminate to be selected by District.
    h. Two (2) angled steel housings to accommodate one (1) each 1/2 shotgun stainless steel pans per housing.
6. **Two (2) Frost Top Modules:**
    a. S/S construction 30" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
    b. Corian tray slide with LED lights fixed on brackets to be 30" A.F.F.
    c. Single recessed frost top. To accommodate two (2) 18" x 26" pan capacity, mechanically cooled, 1/2" recessed, stainless steel frost top, for pre-packed products.
    d. Self-contained condensing unit raised tier to be on 9° incline, pitched toward students.
    e. adjustable sneeze guard with half-height glass and LED light provided over frost tops.
    f. Daisy chain electrical connection to interconnect box located in hot food counter.
    g. Raised stainless steel panels with plastic laminate to be selected by district.
7. **One (1) Cashier and Salad Bar Module:**
    a. Closed base stainless steel construction. Counter height at salad bar to be 30" A.F.F. Counter height at cashier stand to be 34" A.F.F. Stainless steel kick plate.
    b. Electrical cord reel and wrap provided for roll-out salad bar.
    c. Three (3) 12" x 20" pan capacity, mechanically cooled stainless-steel cold pans, 6" deep with self-contained condensing unit. RPI glass colored cold pan insets. Verify color selection with architect and owner.
    d. Drop-in ice cream dispenser located per drawings.
    e. Ten (10) fixed poly casters with 6-1/4" load height with 1/4" tall spacer plates.
    f. Corian tray slide with LED lights on fixed brackets to be 30" A.F.F.
    g. Single tier stainless steel overhead slanted snack rack with 1" OD round posts, anchored to counter frame provided. LED light provided on each tier of snack rack underside for ice cream merchandising.
8. Two (2) 18-gauge type 304 series stainless steel cash drawer with extension slides, cylinder locks and 3" deep stainless-steel liner.
9. Two (2) grommeted holes for POS wires. POS to be provided by owners.
10. Two (2) data cables cable receptacles. Two (2) 120V, 15A, duplex receptacles prewired to cord and plug.
11. Daisy chain electrical connection to interconnect box located in hot food counter. Stainless steel intermediate and under-shelves where possible.
12. Provide two (2) convenience outlets per control panel.
13. Plastic laminate lined knee recess by serving line manufacturer. Liner to have LED light.
14. Counters to be factory installed, manufacturer to provide floor template and coordinate with MEP and any furr down requirements.

15. Manufacturers are to bid all items per specifications, deviations from the specified manufacturers or fabrication will not be accepted.
16. Counter template to coordinate with servery walls, furr downs, electrical and plumbing locations. KEC to coordinate installation and any site conditions with the Trade/General Contractor as required

ITEM NO. 214 CASH REGISTER QUANTITY 2

Manufacturer: Owner Furnished
Model:
Size and Shape: Refer to drawings
Alternate: ---

ITEM NO. 209 DROP FRONT MILK COOLER – 8 CASE QUANTITY 2

Manufacturer: Mod-U-Serve
Model: MCT-DM1
Size and Shape: Refer to drawings
Alternate: **---**

1. 18-gauge S/S fully welded liner.
2. 20-gauge S/S exterior.
3. Double pan insulated doors.
4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 8 case capacity.
11. Strip curtains.
12. Special Instruction: Coordinate location of electrical receptacle so as to not interfere with location of milk dispenser.

ITEM NO. 800 GRAPHICS PACAKGE QUANTITY 1 (LOT)

Manufacturer: The Bubble
Model: Custom
Size and Shape: Refer to drawings
Alternate:

1. Graphics package to include the following: Two (2) ceiling mounted soffits, and wall painting.
2. Verify color, size, and pattern with owner as required.
3. Provide wall painting as directed by architect and owner. Verify color selection with owner, provide chip samples for owner's review.
4. Provide two (2) ceiling mounted soffits, verify all graphics with owner. Suspend from the ceiling and provide additional support as required.
5. KEC to coordinate installation with the any cameras and light fixtures; the graphics should not block any of the camera views.
6. Contractor to properly remove or protect all equipment as required.
7. Graphics package to meet all district standards.

ITEM NO. 801 UTILITY CHASE QUANTITY 1

Manufacturer: Custom Fabrication
Model:
Size and Shape: Refer to drawings
Alternate: Mod-U-Serve

1. 18-guage s/s utility chases located per drawings.
2. Chase to be pre-piped to accommodate water lines at entrance/exit.
3. Pre-wire for single point connection above ceiling.
4. Water-tight internal chase.
5. Single receptacle to accommodate single-point connection from counter.
6. Secure chase to floor and ceiling.

ITEM NO. 804 ICE CREAM DROP-IN CABINET QUANTITY 1

Manufacturer: LTI Serving Technology
Model: DI-2222-IC
Size and Shape: Refer to drawings
Alternate:

1. Locate per drawings.
2. Lid locking assembly.
3. Easy life see-thru lid.
4. Cord and plug assembly.
5. Two large compartments.
6. Two coated baskets.

EAGLE MOUNTAIN ES:

ITEM NO. 186 PASS-THRU HEATED CABINET- 1DR QUANTITY 2

Manufacturer: Winston
Model: CAC522
Size and Shape: Refer to drawings
Alternate: ---

1. Anodized aluminum interior and S/S exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. Universal 18" x 26" pan files on 4" centers in all sections.
6. 6" high adjustable S/S legs.
7. Furnish start-up and three (3) years repair service, including parts and labor.
8. Controls mounted on kitchen side.
9. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
10. Stainless steel removable trim located between wall and top of cabinet.
11. Half height doors hinged as per plan. Stainless doors located on kitchen side and server side.
12. Re-hinging feature.
13. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 188 PASS-THRU REFRIGERATOR - 1DR QUANTITY 2

Manufacturer: Traulsen
Model: AHT-132WPUT
Size and Shape: Refer to drawings
Alternate: ---

1. Anodized aluminum interior and S/S exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. Universal 18" x 26" and 12" x 20" pan files on 4" centers in all sections.

6. 6" high adjustable S/S legs.
7. Furnish start-up and three (3) years repair service, including parts and labor.
8. Controls mounted on kitchen side.
9. Five (5) Year compressor warranty.
10. Fully welded telescoping s/s trim at wall. Trim is not to be secured to the equipment.
11. Stainless steel removable trim located between wall and top of cabinet.
12. Full height doors hinged as per plan. Stainless doors located on kitchen and server side.
13. Re-hinging feature.
14. Special Instruction: Provide opening in wall 10" larger than equipment, KEC to coordinate with GC as required.

ITEM NO. 201 SERVING COUNTER QUANTITY 1

Manufacturer:	Counter Craft
Model:	---
Size and Shape:	Refer to drawings
Alternate:	Mod-U-Serve

1. Semi open base construction. All electrical conduit and plumbing to be located within utility chase as required. Utility chase to be fully accessible from operator side of counter with removable stainless-steel panels.
2. Counter tops located 34" A.F.F. Stainless steel construction 14-gauge, type 304 series with 2" turndowns on all sides.
3. Group "E" Corian tray slide at 30" A.F.F. with polished s/s buttons and under mounted LED lighting. Tray slide to be supported with finished plywood with white melamine at exposed areas. Tray slide brackets to be fully welded to angle iron frame.
4. Sneeze guards provided with adjustable front pivoted tempered glass and tempered glass over-shelf. 1" OD round, fully polished s/s posts penetrating counter top and anchored to counter framing. Top and Front glass to be 3/8" tempered glass. NSF approved side-panels to be 1/4" tempered glass.
5. **Two (2) Hot Food Modules:**
    a. Stainless steel construction. Counter height to be 34" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
    b. Five (5) pan capacity 12" x 20" individual drop-in, 1000-watt wells with infinite switch controls. Wells provided with 1" recess to accommodate 18" x 26" sheet pans. Individual drains valves provided per hot food well.
    c. S/S work shelf on drop-down brackets
    d. Deck mount single pantry fill faucet T&S Model no. B-0208.
    e. Adjustable sneeze guard with full height glass, heat strip and LED light provided over hot food wells.
    f. Daisy chain electrical connection to interconnect box located in hot food counter.
    g. Raised s/s panels with plastic laminate to be selected by District.
    h. Two (2) angled steel housings to accommodate one (1) each 1/2 shotgun stainless steel pans per housing.
6. **Two (2) Frost Top Modules:**
    a. S/S construction 30" A.F.F. on 6" adjustable s/s legs with s/s kick plate.
    b. Corian tray slide with LED lights fixed on brackets to be 30" A.F.F.
    c. Single recessed frost top. To accommodate two (2) 18" x 26" pan capacity, mechanically cooled, 1/2" recessed, stainless steel frost top, for pre-packed products.
    d. Self-contained condensing unit raised tier to be on 9° incline, pitched toward students.
    e. adjustable sneeze guard with half-height glass and LED light provided over frost tops.
    f. Daisy chain electrical connection to interconnect box located in hot food counter.
    g. Raised stainless steel panels with plastic laminate to be selected by district.
7. **One (1) Cashier and Salad Bar Module:**
    a. Closed base stainless steel construction. Counter height at salad bar to be 30" A.F.F. Counter height at cashier stand to be 34" A.F.F. Stainless steel kick plate.

   b. Electrical cord reel and wrap provided for roll-out salad bar.
   c. Three (3) 12" x 20" pan capacity, mechanically cooled stainless-steel cold pans, 6" deep with self-contained condensing unit. RPI glass colored cold pan insets. Verify color selection with architect and owner.
   d. Drop-in ice cream dispenser located per drawings.
   e. Ten (10) fixed poly casters with 6-1/4" load height with 1/4" tall spacer plates.
   f. Corian tray slide with LED lights on fixed brackets to be 30" A.F.F.
   g. Single tier stainless steel overhead slanted snack rack with 1" OD round posts, anchored to counter frame provided. LED light provided on each tier of snack rack underside for ice cream merchandising.
8. Two (2) 18-gauge type 304 series stainless steel cash drawer with extension slides, cylinder locks and 3" deep stainless-steel liner.
9. Two (2) grommeted holes for POS wires. POS to be provided by owners.
10. Two (2) data cables cable receptacles. Two (2) 120V, 15A, duplex receptacles prewired to cord and plug.
11. Daisy chain electrical connection to interconnect box located in hot food counter. Stainless steel intermediate and under-shelves where possible.
12. Provide two (2) convenience outlets per control panel.
13. Plastic laminate lined knee recess by serving line manufacturer. Liner to have LED light.
14. Counters to be factory installed, manufacturer to provide floor template and coordinate with MEP and any furr down requirements.
15. Manufacturers are to bid all items per specifications, deviations from the specified manufacturers or fabrication will not be accepted.
16. Counter template to coordinate with servery walls, furr downs, electrical and plumbing locations. KEC to coordinate installation and any site conditions with the Trade/General Contractor as required

ITEM NO. 214 CASH REGISTER QUANTITY 2

Manufacturer: Owner Furnished
Model:
Size and Shape: Refer to drawings
Alternate: ---

ITEM NO. 209 DROP FRONT MILK COOLER – 8 CASE QUANTITY 2

Manufacturer: Mod-U-Serve
Model: MCT-DM1
Size and Shape: Refer to drawings
Alternate: **---**

1. 18-gauge S/S fully welded liner.
2. 20-gauge S/S exterior.
3. Double pan insulated doors.
4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 8 case capacity.
11. Strip curtains.
12. Special Instruction: Coordinate location of electrical receptacle so as to not interfere with location of milk dispenser.

ITEM NO. 800 GRAPHICS PACAKGE QUANTITY 1 (LOT)

Manufacturer: The Bubble
Model: Custom

Size and Shape: Refer to drawings
Alternate:

1. Graphics package to include the following: Two (2) ceiling mounted soffits, and wall painting.
2. Verify color, size, and pattern with owner as required.
3. Provide wall painting as directed by architect and owner. Verify color selection with owner, provide chip samples for owner's review.
4. Provide two (2) ceiling mounted soffits, verify all graphics with owner. Suspend from the ceiling and provide additional support as required.
5. KEC to coordinate installation with the any cameras and light fixtures; the graphics should not block any of the camera views.
6. Contractor to properly remove or protect all equipment as required.
7. Graphics package to meet all district standards.

ITEM NO. 801 UTILITY CHASE QUANTITY 1

Manufacturer: Custom Fabrication
Model:
Size and Shape: Refer to drawings
Alternate: Mod-U-Serve

1. 18-guage s/s utility chases located per drawings.
2. Chase to be pre-piped to accommodate water lines at entrance/exit.
3. Pre-wire for single point connection above ceiling.
4. Water-tight internal chase.
5. Single receptacle to accommodate single-point connection from counter.
6. Secure chase to floor and ceiling.

ITEM NO. 804 ICE CREAM DROP-IN CABINET QUANTITY 1

Manufacturer: LTI Serving Technology
Model: DI-2222-IC
Size and Shape: Refer to drawings
Alternate:

1. Locate per drawings.
2. Lid locking assembly.
3. Easy life see-thru lid.
4. Cord and plug assembly.
5. Two large compartments.
6. Two coated baskets.

END OF SECTION

SECTION 11 52 13

PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Motorized projection screen.

B. Related Sections:
1. Section 09 91 00 - Painting
2. Division 26 - Electrical: Electrical rough-in

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Include manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Electrically Operated Projection Screen, 144” x 144”, "Large Cosmopolitan Electrol" as manufactured by Da-Lite (a brand of Milestone AV Technologies www.milestone.com) or equivalent as manufactured by Draper, Inc.
1. Mounting: Wall-Mounted.
2. Motor: Electrically operated 120 volt (60 Hz) not more than 2.4 amp. Shall have specially designed motor mounted inside the roller to be three wire with ground quick reversal type, oiled for life, with automatic thermal overload cut-out, integral gears, capacitor and an electric brake to prevent coasting. To have pre-set but adjustable limit switches to automatically stop picture surface in the “up” and “down” positions. Screen shall be listed by U.L.
3.
4. Control Switch: Provide 3-position control switch with cover plate which shall stop or reverse screen at any point in its operating cycle. Controls shall be furnished complete with aluminum box and stainless steel cover plate.
5. Screen Fabric: Da-Lite or Draper “Matte White”, flame- and mildew-resistant fiberglass. The roller to be of aluminum. Provide black border. Bottom of fabric shall be formed into a pocket holding a metal rod. Provide Black “extra drop” above picture area to 4’-0” above finish floor.
6. Case: Case to be a two-piece design made of extruded aluminum and with a white, lightly textured powder coat finish. End caps shall include integrated junction box.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install projection screens securely anchored to provide rigid installation. Screen shall be installed in strict accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Certificate: The distributor or manufacturer's representative shall certify in writing to the Owner that the installation, adjustment and performance are in accordance with the manufacturer's recommendations.

3.3 ADJUST AND CLEAN

A. Adjusting: Carefully adjust and regulate the projection screen after installation.

B. Protection: Protect the completed work from damage. Replace damaged items which cannot be repaired.

C. Cleaning: Upon completion of the building, clean the projection screen. Leave the screen free of defects and in ready-to-use condition.

END OF SECTION

SECTION 11 66 00

ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Athletic equipment.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete: volleyball sleeves.
2. Section 09 65 66 - Athletic Sheet Flooring.
3. Division 26: Electrical: electrical rough-in for backstop motors and scoreboards.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data: Include manufacturer's specifications, anchor details, installation instructions for products and cut sheets.

C. Shop Drawings: Include drawings for fabrication and erection of equipment assemblies which are not fully described in manufacturer's data.

1.3 QUALITY ASSURANCE

A. A. The entire backstop structure shall conform to the current FIBA/NCAA rules and regulations governing basketball in force at time of installation.

1.4 WARRANTY

A. Provide Manufacturer’s Lifetime Warranty against breakage of backboard.

B. Volleyball System:
1. Volleyball standards and winch shall be a limited lifetime warranty.
2. System shall have a 5-year padding warranty
3. 2-year net and antenna warranty.

PART 2 - PRODUCTS

2.1 BASKETBALL BACKSTOPS

A. Backstops: Provide backstops, backboards, goals and nets as manufactured by Porter Equipment Co. **NO SUBSTITUTIONS.**
1. Motorized Forward Folding:
a. Backstop: Model 90949-000, “Center-Strut” Series, ceiling suspended, forward folding, and front braced. Powdercoat color shall be as selected by Architect.
b. Backboard: No. 208-000 glass board (3'-6" x 6'-0").
c. Padding: No. 00326 2" thick bolt-on bottom safety edge padding in color as selected by Architect.
d. Goal: No. 00256500 Torq-Flex goal with mounting hardware and net.
e. Mounting: Furnish framing accessories and associated hardware for a complete and rigid installation.
f. Motorized: No. 707 3/4 horsepower key operated electric winch for each goal with No. 797-100 safety strap.
2. Outdoor Backstop:
a. Backstop: Model 174, 4-1/2" OD galvanized gooseneck post, 4' extension.
b. Backboard: 267 fan fiberglass backboard with border and target.
c. Goal: 236HOO goal with net.
d. Mounting: Furnish all framing, accessories and associated hardware for a complete and rigid installation.

2.2 VOLLEYBALL EQUIPMENT

A. Provide VB1000 complete Centerline Elite Aluminum System as manufactured by Bison, Inc. (www.bisoninc.com) Entire system shall meet or exceed all NCAA, USVBA, NFHS and FIVB requirements for competition. System shall include, but not be limited to the following:
   1. 2 VB10 Aluminum Standards. Standards shall be special 6063-T6 aluminum extrusions.
   2. 2 Nylon Net Collars
   3. 2 VB51P-XX Pole Padding
   4. 3 Carabineer
   5. 2 VB23-CV Floor Plates (If Applicable)
   6. 1 3/16” Allen Wrench
   7. 2 Floor Sockets (If Applicable)
   8. 1 Knurled Knob
   9. 4 Cable Covers (If Applicable)
   10. 6 Rope Ratchet (Provided with Net)
   11. 1 VB1250K Net with Storage Bag
   12. 1 1/8” Allen Wrench
   13. 2 Volleyball Antennas (VB13)
   14. 1 1/4” Allen Wrench
   15. 1 Winch
   16. 1 Positive Lock Pin
   17. 1 Top Net Cable Attachment Screw
   18. Upper post material: 2 1/2″ Aluminum
   19. Lower post material: 3″ Aluminum
   20. Floor socket diameter: 3″ (Free Socket Adapters)
   21. Non-winch post weight: 34#
   22. Winch post weight: 39#
   23. Approx. post deflection: 1.97″
   24. Post warranty: Lifetime Limited
   25. Winch style: 26:1 Worm Gear
   26. Winch warranty: Lifetime Limited
   27. Net height indicator: Engraved
   28. Net height adjustment method: Spring Assisted Telescoping with Stop Pins
   29. Adjustable foot: Yes
   30. Free lettered padding: Yes

B. Volleyball Sleeves: Provide Model VP23, 3” Floating Floor Socket / Floor Plate as manufactured by Bison (www.bisoninc.com) NO SUBSTITUTIONS.

2.3 GYMNASIUM WALL PADDING

A. Provide wall pads as manufactured by Porter Athletic Equipment Co. Vinyl covering shall be flame retardant and comply with UL-214. Vinyl covering shall be as selected by Architect from one of manufacturer's fourteen (14) standard colors. Furnish all framing and associated hardware for complete and rigid installation.
   1. Type A: No. 00560-0XX, panels shall be constructed of 2" Rebonded Foam, 2'-0" wide x 6'-0" high and cemented to 3/8" plywood backing board covered with flame retardant, vinyl coating fabric folded and stapled securely to back of plywood. A 1" nailing margin shall be provided at top and bottom for securing panels to the wall.
   2. Type B: No. 90353-200, panels shall be constructed in an “L” shape of 2" Rebonded Foam, 6'-0" in length with a 6" x 6" inside dimension. Backside of pad shall be provided with two 6'-0" long Velcro strips and two pieces of self-adhesive Velcro attachment strips for applying to wall.

2.4 SCOREBOARDS

A. Basketball: Provide Model BB-1600-4 with MP50 Controller as manufactured by Fair-Play.
   1. Energy efficient LED
   2. Three distinct LED digit colors
   3. Heavy-duty, vibrating horn (103 dB)
   4. Free Help Desk Support
   5. Paint color as selected by Architect.
   6. Vinyl trim color as selected by Architect.
   7. Sport-specific control console inserts
   8. HB-800 data connection kit

9. 5-year limited warranty
10. ETL/CETL listed to UL standard
11. Built-in service points for easy access.
12. Corrosion resistant aluminum construction
13. Complete, safe and durable display mounting system

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install athletic equipment and accessories in accord with the manufacturer's written instructions and recommendations.
   1. Locate equipment accurately and install to be rigid and secure.
   2. Install supplementary framing required for proper supporting of the backstops.
   3. Mount backstops at proper height.
   4. Set post accurately and plumb, hold in position until concrete is placed.
   5. Upright sleeves must be absolutely plumb so that upright posts do not lean.
   6. Volleyball Sleeves: Install sleeve and adapter per manufacturer's written instructions and recommendations. Floor plates shall finish flush with the finish court floor surface.
   7. In addition to securing wall pads at top and bottom at nail strip, apply manufacturer recommended adhesive to back of pads to prevent them from bowing.

3.2 ADJUSTING

A. Adjust movable athletic equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.3 CLEANING AND PROTECTION

A. After completing athletic equipment installation, inspect components. Remove spots, dirt, and debris and tough up damaged shop-applied finishes according to manufacturer’s written instructions.

B. Provide final protection and maintain conditions acceptable to manufacturer and installer that ensure athletic equipment is without damage or deterioration at time of substantial completion.

C. Replace athletic equipment and finishes that cannot be cleaned and repaired, in a manner acceptable to Architect, before time of substantial completion.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 11 68 13

PLAYGROUND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Playground layout (staking).

B. Concrete footings for playground equipment.

C. Playground equipment.

D. Location of each item of playground equipment is indicated on the drawings.

1.2 RELATED REQUIREMENTS

A. Section 32 1816.13 - Playground Protective Surfacing: Protective surfacing in playground area.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.

B. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2009.

C. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2011.

D. CPSC Pub. No. 325 - Public Playground Safety Handbook; Consumer Products Safety Commission; 2010.

1.4 DEFINITIONS

A. Play Event: A piece of playground equipment that supports one or more play activities.

B. Use Zone: The area under and around a play event within which the ground surfacing must meet fall impact attenuation requirements of ASTM F1292 when tested at the fall height specified for the play event.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it, as defined in ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing; specified in Section 32 1816.13 – Playground Surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subgrade: The surface of the ground on which the protective surfacing is installed .

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.
   3. Notify Architect at least 2 weeks prior to meeting.

1.6 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data: For all manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.
   1. Certifications: Provide International Play Equipment Manufacturers Association (IPEMA) certification that product complies with ASTM F1487, excluding section 10 and 12.6.1.

C. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.
   1. Show locations and dimensions of footings and anchorage points.
   2. Clearly identify mounting elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing.

D. Samples: For each item for which color must be selected provide color chart showing full range of colors and finishes.

E. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

F. Manufacturer's Field Report.

G. Certifications: Provide certifications complying with ASTM 1292 and ASTN 1951.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Eagle Mountain-Saginaw ISD's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing materials and products specified in this section, with not less than three years of experience.
   1. Provide documentation showing that playground equipment similar to that specified has been installed in minimum 10 sites and been in successful service for minimum of 5 years; provide addresses.
   2. Provide certificate of Insurance AA rated for minimum 1,000,000 dollars covering both product and general liability.
   3. Manufacturer's Representative: Provide name, company name and address, and playground safety training certificate.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing play events and equipment.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.9 WARRANTY

A. Reference Section 01 78 30 - Warranties and Bonds, for additional warranty requirements.

B. Provide minimum one year warranty for playground equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Playground Equipment:
1. Grounds for Play, Inc.: www.groundsforplay.com
a. Ric Yates: Email; ric.yates@groundsforplay.com Ph; 817-487-5615
2. Little Tykes Commercial Play Structures, Sun Ports Shade Structures, and related surfaces and equipment as installed by Lea Park and Play, Richardson, Texas, shall be considered equal to the specified products, as distributed and installed by Grounds for Play, Inc. Proposed substitutions by Lea Parka and Play shall duplicate the layout, user functionality, and safety of the specified products. Supporting structure must equal or exceed the pipe diameters, gauges and finished of the specified products. Owner reserves the right to approve the final layout and the substitution of similar, but not identical, functionality.
3. Substitutions: See Section 01 62 00 - Product Options.

2.2 PLAYGROUND EQUIPMENT - GENERAL

A. All materials and surfacing shall be coordinated and installed under a single source as specified in Section 132 18116.13 - Playground Protective Surfacing.

B. Design Assumptions: Because the safety of the playground depends on strict conformance to the design criteria, this information is provided for Contractor's information.
1. Playground has been designed for children ages 5 through 12.
2. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

C. Mount all equipment on concrete footings, unless otherwise indicated.
1. The playground protective surfacing constitutes a resilient layer installed over the subgrade; the top of footings and anchorage devices are to be located below the surface of the subgrade.
2. Protective Surfacing Depth: See Section 32 1816.13.
3. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must comply with specified requirements for equipment.
4. Paint the portion of the support that is intended to be installed below the top surface of the protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.

D. Label each equipment item with permanent labels stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

2.3 PLAYGROUND EQUIPMENT

A. Comply with ASTM F1487 and CPSC Pub. No. 325; provide equipment complying with specific requirements for the relevant age group(s).
1. Provide components having factory-drilled holes. Do not use components with extra holes that will not be filled by hardware or covered by other components.

B. 350 SERIES
1. 3.5” O.D. vertical posts
2. 36” deck grid / 48” deck grid
3. 24” diameter plastic / 30” diameter plastic

C. VERTICAL POSTS (STEEL)
1. 13 gauge galvanized steel (3.5” Series)
2. 50,000 PSI yield strength (ASTM E-8)
3. 55,000 PSI tensile strength (ASTM E-8)
4. Triple Flo-Coated corrosion protection - interior and exterior (ASTM B-117)
5. Contains a minimum of 30% recycled steel and is 95%-98% recyclable
6. Manufactured per ASTM 500

D. PIPE
1. Contains a minimum of 30% recycled steel and is 95%-98% recyclable

2. Triple Flo-Coated corrosion protection (interior and exterior)
3. Interior and exterior corrosion resistance (ASTM B-117)
4. Manufactured per ASTM 500
   a. 1-1/4" O.D. ROUND
      1) 14 gauge galvanized steel
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   b. 1.66" O.D. ROUND
      1) 13 gauge galvanized steel
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   c. 1.90" O.D. ROUND
      1) 13 gauge galvanized steel
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   d. 2-3/8" O.D. ROUND
      1) 13 gauge galvanized steel / 9 gauge steel (Bi-pod/Tri-pod top bar)
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   e. 3.5" O.D. ROUND
      1) 13 gauge galvanized steel (3.5" Series)
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   f. 4" O.D. SQUARE
      1) 11 gauge galvanized steel
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)
   g. 5" O.D. ROUND
      1) 11 gauge galvanized steel (5" Series)
      2) 50,000 PSI yield strength (ASTM E-8)
      3) 55,000 PSI tensile strength (ASTM E-8)

E. POST CAPS
   1. Aluminum alloy (GM70B) manufactured and tested in accordance with ASTM Standards: ASTM B 179-68, ASTM B 108-68, ASTM E 10-66 and ASTM E 8-66
   2. Powder coat finish
   3. Available for 3.5" series or 5" series playgrounds
   4. Machine-pressed into end of post and cannot be removed without special tool

F. C-LINE FITTINGS
   1. Aluminum alloy (GM70B) manufactured and tested in accordance with ASTM Standards: ASTM B 179-68, ASTM B 108-68, ASTM E 10-66 and ASTM E 8-66
   2. Mounts to vertical posts with adhesive gasket and four ¼"x1" TORX self-tapping screws with patch
   3. Powder coat finish
   4. Available for panel or pipe applications

G. SEALING GASKET
   1. Neoprene rubber
   2. 60 +/- 5 durometer hardness

H. HARDWARE
   1. Made from stainless steel or corrosion-resistant coated steel
      a. Majority of hardware is stainless steel with exception of the self drilling/self tapping screws and bolts. Stainless steel is too soft for this application.
   2. Conforms to ANSI/ASCE-8-90 (stainless steel)
   3. Passed 100 hour salt test (corrosion-resistant coated steel)
   4. Security patch to insure screw locks into vertical pipe (where applicable)
   5. Special tool required for install
   6. Tamper resistant

I. CHIN-UP BARS
   1. 1-1/4" O.D. round galvanized steel
   2. 3.5" O.D. vertical posts
   3. Powder coat finish

J. SWINGS
   1. SINGLE 5” POST
      a. 5” O.D. round galvanized pipe
      b. Powder coat finish

K. CLEVIS CONNECTOR (SH-40)
   1. Galvanized, forged steel
   2. Tamper resistant
   3. Galvanized hex pin shoulder bolt
   4. Special tool required for install

L. SWING PADS
   1. G-FLEX Wear Mat 40”X40”X1.5”
   2. Beveled edges
   3. No open cell waffle backing
   4. Black PUR bound SBR Rubber shred, reclaimed from auto and truck tile waste
   5. Bound with a high-strength, weather-resistant binder, compressed to a uniform thickness in a heated mold
   6. Impact attenuation: ASTM 1292-04 -- Pass at 4’ (1.5” thick only)
   7. Flammability: ASTM D-2859 - Pass

M. CHAIN (4/0)
   1. Hot dipped, galvanized for rust prevention (ASTM A-153)
   2. Zinc plated (ASTM B-633)
   3. Straight link coil
   4. Maximum working load limit 670 pounds
   5. Minimum ultimate break 2,680 pounds
   6. 0.85” OD - 0.414” ID
   7. 1.80” OAL

N. SWING SEATS
   1. S-02 BELT SEAT
      a. 6” Wide
      b. Compression molded from EPDM co-polymer
      c. Steel inserts for strength and durability
      d. Galvanized hardware

O. PLASTISOL COATED ITEMS
   1. DECKS / PLATFORMS / RAMPS / BRIDGES / ADA PLATFORMS / ADA TRANSFER STATIONS / STAIRS / STEPS
      a. Resistant to abrasion, corrosion, mildew and fungi
      b. Increased traction
      c. Parts are chemically washed then submerged in a heat-activated primer
      d. Parts are then pre-heated then immersed in liquid plastisol
      e. 80-120 mills thick
      f. Hardness of Shore A 83 +/-5 normal durometer range
      g. Baked to a 90% gloss
      h. Material is self-extinguishing
      i. Meets or exceeds automotive specifications NVSS302
      j. Contains UV inhibitors / UV Stabilized
      k. Tensile strength 2,800 psi
      l. Elongation 280%
      m. Tear strength 420 pounds/inch
      n. Flexibility per ASTM D1737-D522

P. GRAB HANDLE
   1. 1-1/4” O.D. round galvanized steel
   2. Pre-treatment wash primer
   3. Powder coat finish

Q. KICK PLATES
   1. 12 gauge galveneal steel sheet metal
   2. Powder coated finish

R. LANDSCAPE TIMBERS - BLACK
1. High density polyethylene copolymer resin - DMDA-6147 Natural 7
2. Blow molded
3. High moldability, toughness and stress-crack resistance
4. Uniform wall thickness
5. 5,000 psi tensile strength (ASTM D638)
6. 3,600 psi yield strength (ASTM D 638)
7. UV Stabilized

S. LANDSCAPE STAKES
1. ¾”x30” dome spike bolt
2. Stakes are A36 mild steel; hot dipped galvanized
3. Manufactured per ASTM A153C HDG

T. ADA LANDSCAPE RAMP
1. 1st quality linear low density polyethylene (LDPE)
2. Rotational molded with mold-in graphics (where applicable)
3. 3/8” wall thickness
4. 2,550 psi tensile strength (ASTM D638)
5. Melt index per ASTM D1238
6. Density per ASTM D4883
7. Peak crystallization temperature per ASTM D3418
8. Flexural modulus per ASTM D790 Procedure B
9. Deflection temperature under load per ASTM D648
10. Environmental stress crack resistance, F50 per ASTM D1693 Condition A
11. UV stabilized / UV 8 Rating (tested per ASTM G155 cycle 1 guidelines)
12. Anti-static inhibitors

U. PLASTICS
1. TUBES / SLIDES / HEX ROOF / PYRAMID ROOF / HOODS / SPINNERS / CRAWL TUNNELS / COLORED LANDSCAPE TIMERS / SPRING ANIMAL BODY / ADA LANDSCAPE RAMP / TORTOISE CLIMB / TIRES / DINOSAUR CLIMBER / BUBBLE WALL / FUN BALL BODY
   a. 1st quality linear low density Polyethylene (LDPE)
   b. Rotational molded with mold-in graphics (where applicable)
   c. 3/8” wall thickness
   d. 2,550 psi tensile strength (ASTM D638)
   e. Melt index per ASTM D1238
   f. Density per ASTM D4883
   g. Peak crystallization temperature per ASTM D3418
   h. Flexural modulus per ASTM D790 Procedure B
   i. Deflection temperature under load per ASTM D648
   j. Environmental stress crack resistance, F50 per ASTM D1693 Condition A
   k. UV stabilized / UV 8 Rating (tested per ASTM G155 cycle 1 guidelines)
   l. Anti-static inhibitors

V. POLY SHEET
1. ACTIVITY PANELS / ROCK WALL CLIMBER / PANEL GATE / RIDER BODY / LILY PAD BRIDGE STEPS / PANEL LADDER / CHALLENGE BRIDGE STEPS / SIGNS / INCH WORM BRIDGE STEPS / BELOW DECK BENCH
   a. 3/4” high density polyethylene sheeting (HDPE)
   b. Tested in accordance with ASTM D1928 Procedure C
   c. Density per ASTM D1505
   d. Melt Index per ASTM D1238
   e. Tensile Strength and Ultimate Elongation per ASTM D638 Type 4
   f. Brittleness temperature per ASTM D746
   g. Flexural modulus per ASTM D790
   h. Coefficient of linear thermal expansion per ASTM E831
   i. Textured, matte finish
   j. UV stabilized
   k. UL 94 HB fire rating
   l. Stain and graffiti resistant
   m. Will not delaminate, splinter or crack
   n. Radiused edges

W. SLIDES
1. WAVE / ALPINE THUNDER / SPIRAL
   a. Roto-molded plastic
   b. Triple Rail / Double Wide slide mount on 48” wide deck (use 3’x4’ rectangle deck on 3.5” Series)

X. SLIDE FOOT
1. 3.5” O.D. support post
2. Pre-treatment wash primer
3. Powder coat finish

Y. SLIDE SUPPORT
1. 3.5” O.D. galvanized steel support post
2. Post manufactured per ASTM 500
3. Plate manufactured per ASTM A90, A568, A902, A924, D2092, E517, E646 and ISO3575
4. Pre-treatment wash primer
5. Powder coat finish

Z. HORIZONTAL LADDERS (STANDARD / 180 DEGREE / 360 DEGREE)
1. TOP RAIL
   a. 2-3/8” O.D. round steel tube
      1) Pre-treatment wash primer
      2) Powder coat finish
   b. END PIPES (where applicable)
      1) 1.9” O.D. round steel tube
      2) Pre-treatment wash primer
      3) Powder coat finish
   c. HAND RAILS
      1) 1-1/4” O.D. round steel tube
      2) Pre-treatment wash primer
      3) Powder coat finish
   d. RUNG LADDER (FREESTANDING ONLY)
      1) 1-1/4” O.D. round steel tube
      2) Pre-treatment wash primer
      3) Powder coat finish

AA. BRIDGES
1. Arched Bridge
   a. BRIDGE
      1) 12 gauge HRPO steel
      2) Perforated surface
      3) Plastisol coating
      4) Perforated surface - approx. 5/8” diameter spaced 1.25” o.c.
   b. HAND RAILS
      1) 1-1/4” O.D. round steel tube
      2) Pre-treatment wash primer
      3) Powder coat finish
   c. SIDE RAILS
      1) Poly sheet
2. Suspension Bridge
   a. BRIDGE
      1) 12 gauge HRPO steel
      2) Perforated surface - approx. 5/8” diameter spaced 1.25” o.c.
      3) Plastisol coating
   b. HAND RAILS
      1) 1-1/4” O.D. round steel tube
      2) Pre-treatment wash primer
      3) Powder coat finish

BB. CLIMBERS
1. Education Climber
   a. CLIMBER
      1) Roto-molded plastic
      2) Mounts on 48” wide deck (uses 3’x4’ rectangle deck on 3.5” Series)
   b. GATED ENTRY

1) 1-1/4" O.D. pipe
2) Pre-treatment wash primer
3) Powder coat finish

c. WIDE SLIDE FOOT
1) 1) 1-1/4" O.D. pipe
2) 12 gauge galvanized steel L-bracket and plate
3) Pre-treatment wash primer
4) Powder coat finish

2. Lily Pad Climber
a. LILY PAD
1) Poly sheet
b. GATED ENTRY
1) 1-1/4" O.D. galvanized pipe
2) Pre-treatment wash primer
3) Powder coat finish
c. SUPPORT POSTS
1) 3.5" O.D. galvanized pipe
2) Pre-treatment wash primer
3) Powder coat finish

3. Climbing Wall
a. CLIMBER
1) Poly sheet
b. FOOT HOLDS
1) Aluminum alloy

4. Bedrock Climber
a. CLIMBER
1) Roto-molded plastic
2) Mounts on 48" wide deck (uses 3'x4' rectangle deck on 3.5" Series)

5. GATED ENTRY
a. 1-1/4" O.D. galvanized pipe
1) Pre-treatment wash primer
2) Powder coat finish

6. Cargo

7. Wall Climber
a. BUBBLE WALL
1) Roto-molded plastic
b. SUPPORT POSTS
1) 3.5" or 5" O.D. galvanized pipe - depending on series
2) Pre-treatment wash primer
3) Powder coat finish

CC. CLIMBERS -- METAL

1. LOOP-2-LOOP / BUBBLE / CLOVER / COIL / DEEP RUNG ARCH / HALF MOON / LOOP / MAN HOLE / MOUNTAIN / QUICK / RING / SNAKE / TREE / ZIPPER / VERTICAL LADDER
a. CENTER POLE
1) 1.66" O.D. galvanized pipe
2) Pre-treatment wash primer
3) Powder coat finish
b. HAND/FOOT RUNGS
1) 1-1/4" O.D. galvanized pipe
a) Pre-treatment wash primer
b) Powder coat finish
c. GATED ENTRY
1) 1-1/4" O.D. pipe
2) Pre-treatment wash primer
3) Powder coat finish
d. BRACKET
1) 9 gauge galvanized flat steel
2) Pre-treatment wash primer
3) Powder coat finish

2. BALANCE BEAM (ZIG ZAG & STRAIGHT)
a. BEAM
1) 4" O.D. square steel tube
2) Pre-treatment wash primer

3) Powder coat finish
b. SUPPORT POSTS
1) 2-3/8" O.D. round steel tube
2) Pre-treatment wash primer
3) Powder coat finish

3. TRAPEZE BAR
a. BAR
1) 1.25" o.d. round steel tube
2) Pre-treatment wash primer
3) Powder coat finish
b. TRAPEZE RING
1) Blue Plastisol coating
2) Grip diameter: 1-1/4"
3) Complies with ASTM and CPSC requirements

4. PIPE WALL
a. 1-1/4" O.D. galvanized steel support post
b. Pre-treatment wash primer
c. Powder coat finish

5. STAIRS
a. TREADS & STRINGERS
1) 12 gauge HR steel
2) Perforated surface - 1.25" o.c. between perforations
3) Plastisol coating
b. ROD
1) ¼" diameter rod
c. HANDRAILS & GATES
1) 1-1/4" O.D. pipe
2) Pre-treatment wash primer
3) Powder coat finish

6. DOMES
a. 1/8" thick
b. Vacuum formed
c. UV stabilized
d. Crack/Break/Shatter resistant
e. Self-extinguishing
f. UL 94 HB fire rating

7. PRE-TREATMENT WASH PRIMER
a. Polyvinyl-butyral resin based primer
b. Used on all mild steel and all weld joints
c. Designed to give adhesion along to a wide variety of metal substrates
d. Provides added metal protection against rust
e. Imparts extra durability to topcoat (powder coat)
f. When reduced properly, it meets the definition of a "pre-treatment" primer found in many air quality regulations

8. COATINGS
a. Plastisol Coating
1) Resistant to abrasion, corrosion, mildew and fungi
2) UL HB 94 burn rating
3) Increased traction
4) Parts are chemically washed then submerged in a heat-activated primer
5) Parts are then pre-heated then immersed in liquid plastisol
6) 80-120 mills thick
7) Hardness of Shore A 83 +/-5 normal durometer range
8) Baked to a 90% gloss
9) Material is self-extinguishing
10) Meets or exceeds automotive specifications NVSS302
11) Contains UV inhibitors / UV Stabilized
12) Tensile strength 2,800 psi
13) Elongation 280%
14) Tear strength 420 pounds/inch
15) Flexibility per ASTM D1737-D522

9. Powder Coating
a. TGIC polyester
b. Electrostatic application
c. Baked-on @ 400 degrees

d. 5-7 mills thick
e. Lead free
f. High gloss
g. No peel / No flake finish
h. Resistant to salt spray (ASTM B-117)
i. Resistant to humidity (ASTM D-2247)
j. Direct/Indirect impact 120 in. pounds (ASTM D-2794)
k. Good to excellent resistance to most solvents, oils, acids and alkalis

2.4 SITE AMENITIES

A. FUN BALL
1. BODY
a. Roto-molded plastic
2. POST
a. 5” O.D. round steel post
b. Powder coat finish

2.5 OUTDOOR FURNITURE

A. BENCHES
1. REGAL STYLE PARK BENCHES
a. The Regal Style benches feature seats made with 3/4" #9 expanded metal, welded inside a 2”x2" angle iron frame. Extra bracing is made with 1-1/2"x1/4" flats. Frames and legs are made from 2-3/8” heavy steel tubing that is galvanized inside and out.
b. Available with or without back, portable, surface mount or in-ground mount and in various lengths.
c. Seat height is approximately 18”. Back height is approximately 32”.
d. Standard benches have a seat width of 10-1/2”.
e. Players benches have extra-wide seats (15” deep).
f. Square leg benches have 4” square legs.
g. Non-corrosive hardware.
h. Coated with 1/8” - 1/4” thick plastisol UV stabilized vinyl coating fused and baked to a 90% gloss.
i. Frames have a baked-on polyester powder coat finish.

2.6 SHADE STRUCTURES

A. FABRIC SHADE STRUCTURES
1. 100% virgin polymer (high density polyethylene, polyester or polypropylene).
2. Warp Knitted fabric (Rachel or tricot type).
3. Fabric shall be stentered (heat set) during manufacture.
4. The knit structure shall be a minimum of 16 gauge / maximum of 24 gauge.
5. Tested in accordance with ASTM D 5035, ASTM D 2261, BS 6906: Part 4.
6. 95%-98% shade cover depending on color.
7. 91% - 99% UV block out depending on color.
8. 80% water repellency.
9. Minimum lifespan of 10 years against UV degradation and shall have a minimum breaking strength of 50% of its initial breaking strength when tested in accordance with ASTM D5035 after 8 years of exposure to sunlight.
10. Submit manufacturers full line of fabric and metal colors for approval.
11. Reference drawings for configuration.

PART 3 - EXECUTION

3.1 LAYING OUT THE WORK

A. Stake the location of all playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures,and planting locations.

B. Stake the layout of the entire Use Zone perimeter before starting any work .
1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
2. Verify that Use Zones are free of obstructions that would extend into the protective surfacing.
3. If conflicts or obstructions exist, notify Architect.

4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.2 EXAMINATION

A. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

B. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

3.3 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing specified in Section 32 1816.13. The protective surfacing is to be installed after playground equipment installation.

B. Install concrete footings with top surface a minimum of 1/2 inch below required subgrade elevation.

C. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction.

D. Anchor equipment securely below the bottom elevation of the resilient surfacing layer.

E. Install without sharp points, edges, or protrusions; entanglement hazards; or pinch, crush, or shear points.

F. Do not modify play events on site without written approval of manufacturer.

G. Install required signage if not factory-installed.

3.4 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.

B. Eagle Mountain-Saginaw ISD or Eagle Mountain-Saginaw ISD's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliance is achieved.

3.5 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

3.6 PROTECTION

A. Protect installed products until Substantial Completion.

B. Replace damaged products before Substantial Completion.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 21 00 00

FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The work in this Division covers all Fire Suppression work specified in all Division 21 Specifications.

B. Contractor shall include providing instructions and demonstrations of the operation of each installed system in its totality to the Owner.

C. Include training of the Owner's Operating Personnel on:

1. Safety Shut-Down of Fire Suppression Equipment.
2. Sequence of Fire Suppression Equipment Operation.
3. Operation and Maintenance of Fire Suppression Equipment.

D. The Conditions of the Contract, including the General Conditions and Supplementary Conditions, and Division 1 - General Requirements, apply to work covered by this section.

E. Comply with other Division 21 Sections as applicable. Refer to other Divisions for coordination of work with other trades.

F. Refer to Specification Section 01 01 00 for “Schedule of Work”.

1.2 RELATED WORK

A. Section 01 16 00: Material and Equipment.

B. Section 01 70 00: Contract Closeout.

C. Section 01 70 30: Operating and Maintenance Data.

1.3 QUALITY ASSURANCE

A. The manufacturer shall be a firm regularly engaged in the manufacture of fire protection equipment and accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. The installer shall be a firm with at least two (2) years of successful installation experience on projects with fire protection equipment and piping similar to that required for this project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to Substantial Completion, fully instruct the Owner in the operation, adjustment, and maintenance of products, equipment, and systems; including, but not limited to all fire suppression equipment, related accessories and components and controls. Owner shall operate all systems in cooperation with Contractor for a period of at least five (5) working days prior to, or shortly after, Substantial Completion.

B. Arrange for services of qualified manufacturer's representatives to fully instruct Owner on specialized portions of installations, such as automatic alarm valve assemblies and tamper and flow switches, fire pump and jockey pump controls (where required), and water treatment systems (where required).

C. Arrange for each installer of equipment that requires regular maintenance to meet with Owner to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by trained manufacturer's representatives. Include detailed review of the following items:

1. Operating and Maintenance Manuals.
2. Record Documents.
3. Spare Parts and Materials.
4. Lubricants.
5. Cleaning.
6. Standard and Extended Warranties.
7. Maintenance and Testing Requirements, Agreements, and similar continuing commitments.

D. As a part of these instructions for operating equipment, demonstrate the following procedures:

1. Start-Up.
2. Shut-Down.
3. General System Operating Instructions.

E. Submit a complete record of instructions as a part of maintenance instructions and the data book (Operations and Maintenance Manual) given to Owner. For each instructional period, supply the following data:

1. Date of Instruction.
2. System or Equipment Involved.
3. Names of Persons Giving Instructions.
4. Other Persons Present.
5. Time Period (in hours/minutes) Instruction Provided.

F. Amount of time to be devoted to instructional sessions shall be reasonable and consistent with the size and complexity of equipment and systems installed and as specified in other sections of these specifications.

3.2 TEMPORARY WORKING ACCESS FOR EXISTING FACILITIES

A. Each respective trade shall remove existing piping, equipment, fixtures, and other items to provide access for work in existing facilities and on the site. Contractor shall seek Owner's Representative approval prior to removal of any equipment and fire protection appurtenances.

B. Reinstall and refinish items removed, or otherwise damaged, to match existing adjacent surfaces upon completion of the work.

3.3 DISRUPTION OF EXISTING FUNCTIONS

A. Access: Access to and use of the existing facilities and site will be restricted, and shall be under the direction and control of the Owner.

B. Disruptions: Maintain existing systems, and maintain existing functions in service except for scheduled disruptions. Where existing functions to remain in use are disrupted, they shall be fully restored after disruption, in full compliance with this Division of the Specifications for new work.

C. Scheduling of Disruptions: Seek and obtain approval by the Owner two (2) weeks in advance of each such event. Failure to schedule such disruptions in advance will result in the Contractor being stopped or rescheduled by the Owner without added cost to the Owner.

D. Notice of Disruption: Date, time and duration of each disruption shall be subject to the Owner's prior written approval and shall include the following information in the form of a memorandum submitted by the Contractor to the Owner's Representative for approval by the Owner:

Facility/System	Date	Starting Time	Duration

E. Emergency Disruptions: When circumstances preclude obtaining advance approval as specified above; make request immediately on knowledge of the requirement, and perform the work so as to cause the minimum amount of disruption, for the minimum duration.

F. Notification: Notify the Owner's Representative and the Owner immediately, by telephone and then in writing, as changes and additions to the scheduled disruption requirements become known.

G. Duration:

1. Complete as large a portion of the work as possible before initiating disruption.
2. Maintain adequate personnel, supplies, materials, equipment, tools, and other resources at job site to avoid unnecessary delay in resumption of normal service.
3. Keep duration of disruption as short as possible.
4. During the disruption, perform only the amount of work that requires the disruption, so as to minimize duration of disruption.

3.4 MODIFICATIONS AND RELOCATIONS FOR EXISTING FACILITIES

A. Modify, remove, or relocate materials and items indicated on the Drawings or required by the installation of new facilities.

B. Relocations:

1. Repair and restore to good functional condition, equipment, materials and items scheduled for relocation, which are damaged during dismantling or reassembly operations.
2. Remove carefully, in reverse order to original assembly or placement, items which are to be relocated.
3. Protect items until relocation is complete.

C. Clean and repair items to be relocated, and provide new materials, fittings, appurtenances required to complete the relocations and to restore to good operating order.

D. Perform the relocation work in accordance with applicable Sections of these Specifications, utilizing skilled workers.

3.5 SCHEDULE OF WORK

A. Reference Division 1 for Additional Scheduling Information.

B. For existing facilities, the Contractor and all system installers for each Section of these Specifications shall realize that the present facility is a completely functioning facility that must continue in full operation during the hours designated by the Owner’s Representative during the construction period. Outages of any kind cannot occur, except only when and as the Owner's Representative or Owner may direct otherwise.

C. The work under the various sections must be expedited and close coordination will be required in executing the work. The various Contractors shall perform their portion of the work at such times as directed so as to insure meeting scheduled dates, and to avoid delaying any other Contractors. The Owner's Representative will verify scheduled times of work in the various areas involved, etc., and each Contractor shall cooperate in establishing these times and locations and shall process their work so as to insure proper execution and completion.

D. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to existing lines, services, or items of equipment in the present building or where existing equipment items or services in that building are to be replaced or modified in any way.

E. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner. New lines shall be installed and tested before connections are made into existing lines, meters, or services.

F. All other modifications to existing piping systems and appurtenances, including necessary interconnections between old and new portions of the various systems, shall be accomplished at times scheduled so as not to interfere with the normal use of the building and the existing systems to which connection is to be made.

G. The use of any type of fastening or hanging device which requires the use of shots or explosives of any nature shall not be used. Explosives shall also not be used for any excavation.

H. Where required by conditions at the site, Contractor shall perform portions of work at night or at other such times as may be required to insure completion of work on schedule. No additional compensation to the Contractor will be paid for such work or required utilities.

I. Contractor shall be available, as deemed necessary for job progress by the Owner, for weekly progress and coordination meetings with the Architect, Engineer, and other Owner's Representatives when required. These meetings shall be used to monitor progress of submittals, receipt of materials, construction progress, cooperation of trades, field coordination by the Contractor, and to resolve unforeseen conditions in an expeditious manner. Failure to attend meetings, to respond in a timely manner to requests for information, or to progress at an acceptable pace to maintain construction schedule shall constitute a delay by the Contractor and may be cause for assessment of fees to the Contractor as outlined in Division 1.

3.6 DISRUPTION OF EXISTING FUNCTIONS

A. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use unless special permission is granted by the Owner.

B. Disruptions: Maintain existing plumbing, fire protection, and other systems, and maintain existing functions in service, except for scheduled disruptions as allowed in Division 1, "General Conditions".

C. Provide all temporary connections as necessary to facilitate the phasing of construction, even where not specifically shown.

3.7 SALVAGE, DEMOLITION, AND RELOCATION

A. It shall be the responsibility of the Contractor to remove and store those items of existing equipment as indicated on the Drawings to be removed. All items of equipment or fixtures removed shall be protected from damage insofar as is practical.

B. Fire protection items to be removed, salvaged, or relocated shall be removed by the respective trade who would normally be responsible to install new work similar to that to be removed. This shall include whatever selective demolition is necessary to avoid damaging other work of other trades. Each trade shall be responsible for their respective demolition. However, all trades shall keep informed as to the project schedule as it relates to the Demolition Scope of Work.

C. These items shall be stored on site for a minimum of two (2) weeks unless indicated otherwise by the Owner's representative to allow for inspection by the Owner. Deliver, all items tagged to be retained by the Owner to a designated storage location on site or to the Owner's designated Service Center or

Warehouse. All items not retained by the Owner shall be removed from the site by the Contractor at no additional cost to the Owner.

D. The attendant piping, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No piping, hangers, etc., shall be abandoned in place. Where branch lines are removed, the branch shall be capped as close to the main as possible.

E. Relocations:

1. Repair and restore to good functional condition materials and items scheduled for relocation and/or reuse and which are damaged during dismantling or reassembly operations.
2. New materials and items of like design and quality may be substituted for materials and items indicated to be relocated, in lieu of relocation, upon approval of shop drawings, product data and samples.
3. Remove carefully, in reverse to original assembly or placement, items which are to be relocated.
4. Protect items until relocation is complete.
5. Clean and repair and provide new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order.
6. Perform the relocation work in accordance with pertinent sections of the specifications, utilizing skilled workers.
7. Refer to Drawings for specific requirements of temporary services and relocated equipment and fixtures.

3.8 CLEAN UP

A. Remove all debris, rubbish, and materials resulting from cutting, demolition, or patching operations from the work area on a daily basis.

B. Transport materials indicated above in approved containers and legally dispose of offsite.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, apply to all work of this Division, whether attached or not.

B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

A. All Division 21 sections of these specifications shall include all labor and material to complete the entire fire suppression systems as specified and shown on the Drawings. All work shall be fully compliant with NFPA 13, 14, 24 Owner’s Insurance Carrier and Local Authority having jurisdiction.

B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.

C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.

D. Refer to "Conditions of Work" in Division 1

1.3 QUALITY ASSURANCE

A. The manufacturer shall be a firm regularly engaged in the manufacture of fire protection equipment and accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. The installer shall be a firm with at least two (2) years of successful installation experience on projects with fire protection equipment and piping similar to that required for this project.

1.4 GENERAL

A. The accompanying Drawings show diagrammatically the general routing and location of the various equipment items and the major interconnecting piping and equipment and backflow preventers, as required by local authority having jurisdiction, without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions, provide proper grading of lines and fully comply with NFPA 13, 14, 24, Owner’s insurance carrier and local authority having jurisdiction. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.

B. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 21 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.

C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

D. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.

E. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.

F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.5 EXAMINATION OF THE SITE

A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.

B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.

C. All site visits shall be coordinated and scheduled with the Owner.

1.6 CUTTING AND PATCHING

A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.

B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 21, consulting with the Architect regarding proper locations and sizes.

C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, devices, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.

D. Holes through concrete shall be drilled with "Mole", "Core-It', or other diamond point hole saw.

E. Refer to Division 01, Cutting and Patching.

1.7 CODE REQUIREMENTS

A. Contractor is required to comply with the requirements of all National, State, local codes and utility companies having jurisdiction and Owner's Insurance Carrier. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.

B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:

1. (NFPA) National Fire Protection Association.
2. (OSHA) Occupational Safety and Health Administration.
3. (NEC) National Electric Code.
4. Local Plumbing Code.
5. Local Building Code.
6. Local Mechanical Code.
7. Local Fire Code.

C. Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.8 RECORD DRAWINGS

A. Contractor shall, during the execution of work, maintain a complete set of "Record Drawings" upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Builts" at Project Close- Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.

B. All "Record Drawings" shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.

C. Refer to Division 01, Execution and Close-Out Requirements.

1.9 RECORDS AND INSTRUCTIONS FOR OWNER

A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Division 01, Execution and Close-Out Requirements:

1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.
4. Operating instructions for fire protection systems. Operating instructions shall include recommended maintenance and testing procedures.
5. Other data and drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
7. Valve tag charts and diagrams specified elsewhere herein.
8. "As-Built" Record Drawings shall be provided in electronic format on a CD (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
9. Provide copies of all City Inspection Certificates of Approval.

10. Provide Contractor's Certification Statement that all piping, devices and equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.

B. Provide not less than one (1) day of operating instructions per building, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the systems and related equipment.

C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.

D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.10 SHOP DRAWINGS AND SUBMITTALS

A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all equipment, devices and materials designated on the Drawings and specified herein. Electronic PDF copies of each shall be submitted.

B. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgment of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.

C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.

D. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.

E. Shop Drawings are not intended to cover detailed quantitative lists of piping, fittings, valves, devices, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.

F. Shop Drawings prepared to illustrate how equipment, piping, equipment, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.

G. Various material submissions of such items as shown valve assemblies, backflow preventers, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets for each item submitted shall have sufficient bare space to allow for shop drawing review stamps

H. Contractor shall process his submitted data to insure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.

I. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents, NFPA, Owner's Insurance Carrier and local authority having jurisdiction.

J. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.11 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

A. Seal voids around pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 84 00, Fire-Stopping.

1.12 DRAWINGS

A. Drawings show diagrammatically the locations of the various pipes, valves and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.

B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.

D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.

E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.13 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 21.

B. Furnish materials and labor required for the connection of this equipment.

C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.14 COOPERATION

A. Coordinate all work indicated in Division 21 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.

B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.

C. Should any questions arise between work specified in Division 21 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.15 MATERIALS AND EQUIPMENT

A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed unless specifically noted on the Drawings.

B. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA

C. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Division 01, Product Requirements. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.

D. Listed Manufacturers:

1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.

E. Product Options:

1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.
4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

F. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.

5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

G. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

H. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

I. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.16 EQUIPMENT SIZES AND REQUIREMENTS

A. Space allocations in machinery and mechanical equipment spaces are based on equipment scheduled in each case. Should the Contractor request a substitution for equipment of another make that requires more space in any critical dimension, the Contractor shall submit, together with other submittal data on the equipment, prints of drawings indicating how the equipment may be installed, indicating room for servicing and revisions in piping or ducting and any other details necessary for the Architect to form a judgment as to the suitability of the substitute material, as to performance, suitability for the space and other variables.

B. Structural steel members are indicated to provide supports for certain specific sizes and weights of equipment. Should a substitution request involve other equipment, the spacing of the supports shall be varied to suite the equipment. Should the weight or size of a proposed substituted item of equipment require additional supporting steel members, the Contractor shall include documentation of the additional supports in the request for substitution and install them at no change in contract price if the substitution is accepted.

C. Various large apparatus to be installed may require that the apparatus be installed prior to the installation of portions of structural, walls, or door frames. Coordinate the installation of these items to insure that no demolition of general construction is necessary for equipment installation or that the apparatus does not have to be disassembled for installation.

1.17 STORAGE AND PROTECTION OF MATERIALS

A. Store and protect materials and equipment as specified in Division 01, Product Requirements.

B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.

C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.18 FOUNDATIONS

A. Provide equipment foundations associated with the work specified in Division 21.

B. All top corners and edges of all foundations shall be neatly chamfered at a one inch (1") high 45 degree angle.

C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.

D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.

E. Unless otherwise noted, foundations shall be four inches (4") thick for fire pumps and motors and other mechanical equipment, unless thicker foundations are required or recommended by the equipment manufacturer.

F. All concrete work shall conform to the requirements of Division 03, Cast-in-Place Concrete.

G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 21 specifications. Pads shall extend a minimum of two inches (2") in each direction beyond the equipment size.

1.19 EXCAVATION AND BACKFILLING

A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.

B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.

1.20 WIRING

A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.

B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.

C. All power for control circuits required for the Fire Sprinkler System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.

D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.

E. All motors furnished as a portion of work specified in Division 21 shall be wired as specified in Division 26.

F. Except where combination starter-disconnects are specified elsewhere herein or in Division 26, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.

G. Furnish all necessary wiring diagrams for equipment specified in Division 21, as a part of equipment submittals, for installation under other sections of these specifications.

1.21 EQUIPMENT STANDARDS

A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.

B. First of a kind new technology devices will not be considered.

C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.22 CLEAN UP

A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.

B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.

C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, valve assemblies, and devices.

D. Refer to Division 1.

1.23 FINAL CONSTRUCTION REVIEW

A. Schedule: Upon completion of the work specified in Division 21, there shall be a final construction review of the completed systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed and tested, in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.

B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.

C. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.24 CERTIFICATIONS

A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.

B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.25 GUARANTEE

A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance.

B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not operating as intended, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.

C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 21 13 13

WET PIPE FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with Division 21 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of fire protection systems, which shall include the automatic wet pipe sprinkler systems for the entire existing building and additions.

B. The extent of Fire Sprinkler piping work is not indicated by drawings and schedules. The successful Contractor shall prepare and submit drawings and schedules for approval by the requirements of this section, and is hereby defined to include (but is not necessarily limited to) purchase and complete installation of alarm check valves and trim, feed and cross main piping, branch line piping, test valves, test conditions and sprinklers. Inside fire department valve connections, as required by local authorities. Fire Sprinklers shall be installed to serve the entire Building Complex.

C. A sprinkler layout is not shown on the plans. The successful Contractor shall prepare shop drawings for the hydraulically designed sprinkler system and secure approval of same from the Local City Authorities, I.S.O. Commercial Risk Services Group representing the Texas State Insurance Authorities Review Board and the Owner’s insurance carrier. Approved plans and submittals shall be submitted to the Architect for approval before any materials are fabricated.

D. The existing buildings shall be served by two (2) systems in accordance with NFPA-13, 14, and 24. The Contractor shall extend the sprinkler system piping to a point as shown or noted on the drawings.

E. The Contractor shall obtain from the City a current water flow test close as possible to the proposed building addition use this information for the basis of design of the hydraulically calculated system. Flow test shall have been taken in the last six months. Should a current flow test not be available, the Contractor shall conduct the test in the presence of the local fire department representative. **This information shall be used for the basis of design of the hydraulically calculated system.**

F. The Contractor shall comply with NFPA 13 “Water Supply Treatment” in areas with water supplies known to have contributed to Microbiologically Influenced Corrosion (MIC) of sprinkler piping. The Contractor shall provide an Alternate Bid for testing and appropriately treating the water supply.

G. In addition to the requirements of the governing authorities, the following design criteria shall be met:

1. The sprinkler system shall be designed to meet the hydraulically most remote requirements. Provide GPM density and remote area square footage as required by Owner’s Insurance Carrier and by NFPA Standards. (The most stringent shall be used).
2. A 10 psig safety factor shall be designed into all the hydraulic calculations.
3. The maximum velocity in the pipes shall not exceed 32 ft. /sec.
4. Sprinkler spacing shall not exceed 400 sq. ft. for light hazard areas and 130 sq. ft. for ordinary hazard. Sprinkler spacing shall be further restricted by ceiling type where appropriate per NFPA-13. Extended coverage sprinklers are not acceptable.
5. A main drain shall be provided next to the main sprinkler/standpipe riser.

6. Sprinklers shall be installed in stairwells, elevator shafts, and in all other areas as required by NFPA.
7. Floor openings shall be protected by closely spaced sprinkler heads in combination with draft stops as required by NFPA 13.

1.3 GOVERNING AUTHORITIES

A. The automatic sprinkler system shall comply with applicable State and City codes, with the requirements of other authorities having jurisdiction, and with the requirements of NFPA-13, 14 and 24.

B. Comply with all requirements of the Local Authorities and Owner’s Insurance Carrier. Provide sprinkler products bearing approval from Underwriter's Laboratories or Factory Mutual Engineers.

1.4 QUALITY ASSURANCE

A. The manufacturer shall be a firm regularly engaged in the manufacture of fire protection equipment and accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. The installer shall be a firm with at least two (2) years of successful installation experience on projects with fire protection equipment and piping similar to that required for this project.

C. FM Compliance: Comply with Factory Mutual "Approval Guide"

1. FM approvals Marks: Provide units bearing FM approval marks.

D. UL Labels: Provide units which have been approved and listed by Underwriter's Laboratories.

E. Comply with NFPA Standards, Governing Fire Prevention Code, Local Regulations and Ordinances governing fire sprinkler piping.

F. Coordinate with fire alarm installation for required monitoring of the sprinkler system.

G. The Contractor shall be licensed by the Texas Commission on Fire Protection for sprinkler installation and shall have five (5) years experience installing sprinkler systems of this size and scope. The contractor shall provide evidence of these requirements upon request. The contractor shall have an established service organization within a 50 mile radius of the job site.

H. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA.

1.5 SUBMITTALS

A. Submit coordinated shop drawings and details of each fire protection system to, and receive approval from, the governing authorities before the submittal is forwarded to the Architect and before installation work is started. Refer to Section 21 05 00 and appropriate Architectural section.

B. Submit to the Architect, upon completion of each system, a certificate stating that the work has been completed and tested in accordance with NFPA Standards, that there are no defects in the system, and that it is operational. Test procedures and certificate format shall be in accordance with NFPA-13 and NFPA 14 unless otherwise directed by the governing authorities.

C. Submit to the Architect upon completion of the system, manufacturer data of all products incorporated in this work.

D. Submit the following Products Data, Shop Drawings and Samples:

	Product Data	Shop Drawings	Samples
Heads	X	X	
Valves	X	X	
Hangers	X	X	
Piping Material & Jointing Method	X		
System Layout		X	

1.6 MAINTENANCE STOCK, FIRE SPRINKLERS

A. Maintenance Stock: For each style and temperature range required, furnish an additional two (2) fire sprinklers and concealed covers for every 100 units installed, but not less than six (6) fire sprinklers and twelve (12) concealed sprinkler covers of each type.

1.7 COORDINATION

A. The Contractor shall examine all other work shown on the plans and such work installed at the job site. The sprinkler system Contractor shall coordinate the routing of his work with existing conditions and other construction trades to avoid interference with the other installations. Pipe routing shall be located as required to avoid equipment, plumbing drain pipe, heating and air conditioning piping, ductwork, light fixtures, and electrical buss ducts. This Contractor shall provide pipe offsets, etc., as required to complete the installation. Shop prefabricated piping, pipe hangers, etc., shall be modified as required to fit the job site conditions.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Cover and protect materials in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall be rejected.

B. Storage and protection of materials shall be in accordance with Section 21 05 00.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall comply with the requirements of NFPA-13, Owner’s Insurance Carrier, UL, FM and Section 21 05 00.

2.2 PIPE AND FITTINGS

A. Underground within 5'-0" of the Building:

1. Type: AWWA C151, Class 52 cement lined, ductile iron.
2. Wrapping: Buried pipe wrapped with 8 mil polyethylene encasement, AWWA C105.
3. Buried Fittings (size 4 inch through 12 inch): Ductile iron compact type with push-on joints, ANSI A21.53/AWWA C153, or standard fittings, AWWA C110. Use mechanical joints with retainer glands where required for complete system. Equal to Tyco or Victaulic.
4. Underground Riser, welded 304 stainless steel one-piece riser assembly with flanged end and tie-rod bracket, UL and FM approved, AMES Model “1 BR Series”.

B. Underground 5'-0" beyond the Building: Pressure Class 200, polyvinyl chloride (PVC) water pipe conforming to ASTM D-2241, AWWA C-900 D.R. 14 with cast iron pipe outside dimension requirements

of size indicated. Fittings shall be cast iron conforming to ANSI A21-10. All metallic fittings and valves shall be cathodically protected.

C. Above Grade, Indoor Piping: Pipe Size 1-1/2 Inch and Smaller ASTM A-53/135, Schedule 40, black steel pipe, piping by Bull Moose, Allied, or Wheatland Tube. Provide fittings as follows:

1. Fittings: Pipe Size 1-1/2 Inch and Smaller: Class 150 malleable iron, threaded fittings, ANSI B16.3.
2. Acceptable manufacturers: Victaulic, Tyco, or Anvil.

D. Above Grade, Indoor Piping: Pipe Size 2 Inch and Larger ASTM A-53/135, Schedule 10, black steel pipe, piping by Bull Moose, Allied, or Wheatland Tube. Provide fittings as follows:

1. Fittings: Pipe Size 2 Inch and Larger: UL listed, FM approved mechanical grooved couplings with flush sealed gasket style equal to Victaulic “AWWA Flush Seal”.
2. Acceptable manufacturers: Victaulic, Tyco, or Anvil.

E. No Mechanical Tees shall be installed.

F. Outdoors or Exposed to Moisture: Same as specified for "Above Grade, Indoor Piping", except pipe shall be hot dipped galvanized.

G. Fire Sprinkler Drain Piping:

1. Pipe size 2" and smaller: Black steel pipe and fittings: Pipe weight: Schedule 40; Fittings: Class 125 cast iron screwed; Fittings: Class 150 malleable iron, screwed.
2. Pipe size 2-1/2" and larger: Black steel pipe and fittings: Pipe weight: Schedule 40; Fittings: Wrought iron or Schedule 10, rolled-grooved couplings and fittings.

2.3 PIPE SLEEVES

A. Pipe sleeves through grade beams or ground floor slab shall receive “Link Seal” closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.

2.4 VALVES

A. General: Conform to the requirements of NFPA-13 and NFPA-14.

B. Check Valves: Provide Victaulic “Firelok” 717 Series or Tyco CV-1F, check valves 2-1/2" and larger with automatic ball drips for fire department connections.

C. Alarm Valve Assemblies: Provide approved alarm valves, 175 LBS rated pressure complete with all variable pressure trim, valves, etc., as required, equal to Tyco CV1-FR.

D. Sectional Valves: Provide indicating butterfly valve, 175 LB rated working pressure, of size and end types indicated: 2" and larger Tyco BFV-N or Victaulic “Firelok” 705 Series.

2.5 AUTOMATIC SPRINKLERS

A. Fire Sprinklers: Provide standard coverage quick-response Bulb-Type, (“O-Ring” water seal design not acceptable) automatic fire sprinklers with 165 Deg. F., or as required by NFPA-13, operating temperature of the following style and finish (all sprinkler heads shall be centered in the ceiling tiles). Acceptable manufacturers: Tyco, Reliable, or Viking.

NOTE: Sprinklers shall be limited to 400 sq. ft. coverage for light hazard and 130 sq.ft. for ordinary hazard area.

1. Upright type in mechanical spaces and gymnasium without ceilings equal to Tyco Model TY-FRB. Sprinkler Finish: Cast brass (in non-exposed areas) and chrome plated (in occupied areas). Provide cage guards in mechanical spaces, gymnasiums and any areas sprinklers are subject to damage.
2. Provide fully concealed pendent type in all finished areas with ceiling or soffit with factory painted "off-white" threaded cover plate equal to Tyco Quick Concealed sprinkler model RFII “Royal Flush II”.
3. Provide in heated spaces only exposed chrome plated horizontal and vertical side wall sprinklers equal to Tyco-TY-FRB.
4. Provide in heated spaces only, recessed chrome plated horizontal sidewall sprinklers equal to TYCO series EC-5.

B. Sprinklers in non-heated outside storage rooms, covered loading dock, building soffit overhang, walk-in coolers and freezers shall be Viking Model "VK-182" dry horizontal sidewall "VK-180" upright or concealed pendent sprinklers. Provide length of pre-charged riser as required to keep wet section of piping in heated space. Equivalent sprinklers by Reliable, Grinnell or Viking will be acceptable.

C. Emergency Head Storage Cabinet: Provide a red, baked enamel, steel sprinkler cabinet to store the extra sprinklers and wrenches, as required by NFPA-13.

D. Provide cage guards for sprinkler head in the Gymnasium, where exposed in the Locker Room and where sprinklers are installed at or below 8'-0". Cage guards shall be UL listed and engineered products equal to SprinkGuard products.

2.6 ACCESSORIES

A. Tamper Switches: Provide tamper switches equal to Potter type OSYSU or PCVS on all control valves for connection to the fire alarm system.

B. Water Flow Detectors: Provide water flow detectors equal to Potter type VRS Series. Provide a water flow detector at the main fire protection piping entrance to the building or system, in addition to other locations shown, specified, or required, to detect any flow in the system from any cause. If flow is detected, sound a local alarm. See fire alarm section for connection to fire alarm system.

C. Pressure Gauges: Provide 3-1/3 inch diameter pressure gauges equal to Potter-Roemer No. 6240 with stainless steel case and with a range of 0-300 psig, include gauge cock.

D. Wall mounted weather-proof horn/strobe: Provide wall mounted weather-proof, red finished, 120V exterior horn/strobe, UL listed FM approved, with back-box equal to Potter SH-120 Series.

E. Ball Drips: Provide ball drips equal to Tyco AD-2, automatic ball drips for piping between check valves and fire department connections. Extend drain line from each ball drip to point of disposal as shown on the Drawings, or as directed.

F. Flexible Sprinkler Drops shall only be allowed if they are hydraulically designed in the system calculations. Flex connections shall not exceed 36” in length. Flexible drops shall be braided stainless steel as manufactured by Flex Head or Victaulic VicFlex.

G. Automatic Air Vents: Provide as required by NFPA 13, shall be UL listed, FM approved rated up to 175 psig. Provide with ball valve and union upstream of the y-strainer. Potter PAV or pre-approved equal.

H. Hangers and Supports: Provide hangers and supports as required by NFPA-13.

I. Outside Fire Department Connections:

1. Flush (wall) type devices shall be equal to Potter-Roemer No. 5124, 2-way, Fire Department Connection with individual drop clapper valves, plugs, chain, and escutcheon lettered "AUTO. SPKR". Entire unit shall have polished chrome finish, size shall be 2-1/2" x 2-1/2" x 4". Provide “storz” connection as required by local Fire Department equal by Guardian Fire Equipment or Croker.

2.7 PROTECTION OF ELECTRICAL EQUIPMENT

A. Where required, provide metal hoods or shields to protect electrical equipment and bus ducts from sprinkler discharge.

B. No sprinkler mains or branches shall pass through an Electrical Room, IDF Room or MDF Room.

C. Only the branch line serving that specific Electrical Room, IDF Room or MDF Room shall enter that specific room.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install automatic sprinkler system where shown on the Drawings or as noted. Installation shall comply with the requirements of NFPA-13, these Specifications, and the governing authorities, and with the manufacturers' written instructions. Coordinate with other work, including plumbing piping, as necessary to interface components of fire sprinkler piping properly with other work.

B. Welding shall comply with the requirements of Section 21 05 00, State Insurance Authorities and NFPA 51B. No butt welds are allowed.

C. Provide pipe offsets as required. Modify shop pre-fabricated piping, pipe hangers, and other components as required to fit the job site conditions.

D. No mechanical tees shall be installed.

E. Installation of hoods and shields for protection of electrical equipment shall be in accordance with approved details, included as a part of the coordinated shop drawings.

F. Install sectional valves in inlet piping at the bottom of each riser and in loops as indicated or required.

G. Install air vents at the high points of the sprinkler piping.

H. Install a tamper switch on hose connection cabinet door, each sectional valve and on each other shut-off valve.

I. Install drain piping at all low points of the sprinkler piping.

J. Thrust blocks shall comply with NFPA #24 and be of size required for the soil bearing strength and against compacted soil.

K. Install water flow detectors at each take-off from a sprinkler riser or for each zone.

L. Install pressure reducing valve as required by NFPA 13.

M. Install heads in all locations, pendant or upright, as required to provide complete coverage. Sprinkler heads shall be strictly coordinated with diffusers, return air grilles, lights, ceiling type and other trades.

N. Where wet system piping is subject to freezing conditions, provide electric heating tape and insulation. Contractor shall coordinate with and pay any additional cost for the Electrical Contractor for required power circuits.

O. Install sprinklers in finished ceilings to be centered on ceiling pattern; center of 2 x 2, or 2 x 4, tiles; centered both ways for special pattern ceilings. Coordinate head locations with ceiling finishes and types. Provide additional sprinklers as necessary for symmetrical layout. Refer to Architectural Reflected Ceiling Plan for ceiling type and suggested head location. Where head locations are not shown, locate as required and submit to Architect for approval prior to installation.

3.2 IDENTIFICATION

A. Apply signs to identify purposes and functions of controls, and to identify drain, test, and alarm valves. Provide letter sizes and styles as selected by the Architect from NFPA's suggested styles.

3.3 CLEANING AND FLUSHING

A. Prior to connecting sprinkler piping for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After sprinkler piping installation has been completed, and before piping is placed in service, flush each sprinkler system under pressure to remove foreign substances as required by NFPA-13 and NFPA-14. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.4 TESTS

A. After flushing each system, hydrostatically test sprinkler piping in accordance with NFPA-13 and NFPA-14. Check system for leakage at joints. Measure hydrostatic pressure at low point of each system or zone being tested.

B. Repair or replace piping system as required to eliminate leakage in accordance with NFPA Standards, then retest as specified to demonstrate compliance.

3.5 CERTIFICATION

A. Before final approval of the fire protection systems are requested, provide the Owner’s Representation a statement that all requirements of the State Board of Insurance, City Building Inspection, Owner’s insurance and Fire Departments have been met in the installation of the fire protection systems.

END OF SECTION

SECTION 22 00 00

PLUMBING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The work in this Division covers all plumbing work specified in all Division 22 Specifications.

B. Contractor shall include providing instructions and demonstrations of the operation of each installed system in its totality to the Owner.

C. Include training of the Owner's Operating Personnel on:

1. Safety Shut-Down of plumbing Equipment.
2. Sequence of plumbing Equipment Operation.
3. Operation and Maintenance of plumbing Equipment.

D. The Conditions of the Contract, including the General Conditions and Supplementary Conditions, and Division 1 - General Requirements, apply to work covered by this section.

E. Comply with other Division 22 Sections as applicable. Refer to other Divisions for coordination of work with other trades.

F. Refer to Specification Section 01 01 00 for “Schedule of Work”.

1.2 RELATED WORK

A. Section 01 16 00: Material and Equipment.

B. Section 01 70 00: Contract Closeout.

C. Section 01 70 30: Operating and Maintenance Data.

1.3 DESCRIPTION OF PLUMBING DEMOLITION WORK

A. Contractor shall remove several items of materials and equipment under this Section of the Specifications. Equipment and materials to be removed shall be as indicated and noted on the Drawings and as required to facilitate the new installations.

B. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner's Representative.

PART 2 - EXECUTION (Not Used)

PART 3 - EXECUTION

3.1 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to Substantial Completion, fully instruct the Owner in the operation, adjustment, and maintenance of products, equipment, and systems; including, but not limited to all plumbing equipment, related accessories and components, temperature controls and the energy management system. Owner shall operate all systems in cooperation with Contractor for a period of at least five (5) working days prior to, or shortly after, Substantial Completion.

B. Arrange for services of qualified manufacturer's representatives to fully instruct Owner on specialized portions of installations, such as pumps, heat exchangers, tempering valves, automatic temperature controls, and water treatment systems.

C. Arrange for each installer of equipment that requires regular maintenance to meet with Owner to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by trained manufacturer's representatives. Include detailed review of the following items:

1. Operating and Maintenance Manuals.
2. Record Documents.
3. Spare Parts and Materials.
4. Lubricants.
5. Cleaning.
6. Standard and Extended Warranties.
7. Maintenance Requirements, Agreements, and similar continuing commitments.

D. As a part of these instructions for operating equipment, demonstrate the following procedures:

1. Start-Up.
2. Shut-Down.
3. General System Operating Instructions.
4. Emergency Operating Conditions.
5. Noise and Vibration Adjustments, where applicable.
6. Safety Procedures.
7. Economy and Efficiency Adjustments.
8. Effective Energy Utilization.

E. Submit a complete record of instructions as a part of maintenance instructions and the data book (Operations and Maintenance Manual) given to Owner. For each instructional period, supply the following data:

1. Date of Instruction.
2. System or Equipment Involved.
3. Names of Persons Giving Instructions.
4. Other Persons Present.
5. Time Period (in hours/minutes) Instruction Provided.

F. Amount of time to be devoted to instructional sessions shall be reasonable and consistent with the size and complexity of equipment and systems installed and as specified in other sections of these specifications.

3.2 TEMPORARY WORKING ACCESS

A. Each respective trade shall remove existing piping, equipment, fixtures, and other items to provide access for work in existing facilities and on the site. Contractor shall seek Owner's Representative approval prior to removal of any equipment and mechanical appurtenances.

B. Reinstall and refinish items removed, or otherwise damaged, to match existing adjacent surfaces upon completion of the work.

3.3 DISRUPTION OF EXISTING FUNCTIONS

A. Access: Access to and use of the existing facilities and site will be restricted, and shall be under the direction and control of the Owner.

B. Disruptions: Maintain existing mechanical and other existing systems, and maintain existing functions in service except for scheduled disruptions. Where existing functions to remain in use are disrupted, they shall be fully restored after disruption, in full compliance with this Division of the Specifications for new work.

C. Scheduling of Disruptions: Seek and obtain approval by the Owner two (2) weeks in advance of each such event. Failure to schedule such disruptions in advance will result in the Contractor being stopped or rescheduled by the Owner without added cost to the Owner.

D. Notice of Disruption: Date, time and duration of each disruption shall be subject to the Owner's prior written approval and shall include the following information in the form of a memorandum submitted by the Contractor to the Owner's Representative for approval by the Owner:

Facility/System	Date	Starting Time	Duration

E. Emergency Disruptions: When circumstances preclude obtaining advance approval as specified above; make request immediately on knowledge of the requirement, and perform the work so as to cause the minimum amount of disruption, for the minimum duration.

F. Notification: Notify the Owner's Representative and the Owner immediately, by telephone and then in writing, as changes and additions to the scheduled disruption requirements become known.

G. Duration:

1. Complete as large a portion of the work as possible before initiating disruption.
2. Maintain adequate personnel, supplies, materials, equipment, tools, and other resources at job site to avoid unnecessary delay in resumption of normal service.
3. Keep duration of disruption as short as possible.
4. During the disruption, perform only the amount of work that requires the disruption, so as to minimize duration of disruption.

3.4 MODIFICATIONS AND RELOCATIONS

A. Modify, remove, or relocate materials and items indicated on the Drawings or required by the installation of new facilities.

B. Relocations:

1. Repair and restore to good functional condition, equipment, materials and items scheduled for relocation, which are damaged during dismantling or reassembly operations.
2. Remove carefully, in reverse order to original assembly or placement, items which are to be relocated.
3. Protect items until relocation is complete.
4. Clean and repair items to be relocated, and provide new materials, fittings, appurtenances required to complete the relocations and to restore to good operating order.

C. Perform the relocation work in accordance with applicable Sections of these Specifications, utilizing skilled workers.

3.5 SCHEDULE OF WORK

A. Reference Division 1 for Additional Scheduling Information.

B. For existing facilities, the Contractor and all system installers for each Section of these Specifications shall realize that the present facility is a completely functioning facility that must continue in full operation during the hours designated by the Owner’s Representative during the construction period. Outages of any kind cannot occur, except only when and as the Owner's Representative or Owner may direct otherwise.

C. The work under the various sections must be expedited and close coordination will be required in executing the work. The various Contractors shall perform their portion of the work at such times as directed so as to insure meeting scheduled dates, and to avoid delaying any other Contractors. The

Owner's Representative will verify scheduled times of work in the various areas involved, etc., and each Contractor shall cooperate in establishing these times and locations and shall process their work so as to insure proper execution and completion.

D. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to existing lines, services, or items of equipment in the present building or where existing equipment items or services in that building are to be replaced or modified in any way.

E. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner. New lines shall be installed and tested before connections are made into existing lines, meters, or services.

F. All other modifications to existing piping systems and appurtenances, including necessary interconnections between old and new portions of the various systems, shall be accomplished at times scheduled so as not to interfere with the normal use of the building and the existing systems to which connection is to be made.

G. The use of any type of fastening or hanging device which requires the use of shots or explosives of any nature shall not be used. Explosives shall also not be used for any excavation.

H. Where required by conditions at the site, Contractor shall perform portions of work at night or at other such times as may be required to insure completion of work on schedule. No additional compensation to the Contractor will be paid for such work or required utilities.

I. Contractor shall be available, as deemed necessary for job progress by the Owner, for weekly progress and coordination meetings with the Architect, Engineer, and other Owner's Representatives when required. These meetings shall be used to monitor progress of submittals, receipt of materials, construction progress, cooperation of trades, field coordination by the Contractor, and to resolve unforeseen conditions in an expeditious manner. Failure to attend meetings, to respond in a timely manner to requests for information, or to progress at an acceptable pace to maintain construction schedule shall constitute a delay by the Contractor and may be cause for assessment of fees to the Contractor as outlined in Division 1.

3.6 DISRUPTION OF EXISTING FUNCTIONS

A. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use unless special permission is granted by the Owner.

B. Disruptions: Maintain existing domestic water, domestic hot water, sump pumps, sewage ejectors and other systems, and maintain existing functions in service, except for scheduled disruptions as allowed in Division 1, "General Conditions".

C. Provide all temporary connections as necessary to facilitate the phasing of construction, even where not specifically shown.

3.7 SALVAGE, DEMOLITION, AND RELOCATION

A. It shall be the responsibility of the Contractor to remove and store those items of existing equipment as indicated on the Drawings to be removed. All items of equipment or fixtures removed shall be protected from damage insofar as is practical.

B. Plumbing items to be removed, salvaged, or relocated shall be removed by the respective trade who would normally be responsible to install new work similar to that to be removed. This shall include whatever selective demolition is necessary to avoid damaging other work of other trades. Each trade shall

be responsible for their respective demolition. However, all trades shall keep informed as to the project schedule as it relates to the Demolition Scope of Work.

C. These items shall be stored on site for a minimum of two (2) weeks unless indicated otherwise by the Owner's representative to allow for inspection by the Owner. Deliver, all items tagged to be retained by the Owner to a designated storage location on site or to the Owner's designated Service Center or Warehouse. All items not retained by the Owner shall be removed from the site by the Contractor at no additional cost to the Owner.

D. The attendant piping, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No piping, hangers, etc., shall be abandoned in place. Where branch lines are removed, the branch shall be capped as close to the main as possible.

E. Relocations:

1. Repair and restore to good functional condition materials and items scheduled for relocation and/or reuse and which are damaged during dismantling or reassembly operations.
2. New materials and items of like design and quality may be substituted for materials and items indicated to be relocated, in lieu of relocation, upon approval of shop drawings, product data and samples.
3. Remove carefully, in reverse to original assembly or placement, items which are to be relocated.
4. Protect items until relocation is complete.
5. Clean and repair and provide new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order.
6. Perform the relocation work in accordance with pertinent sections of the specifications, utilizing skilled workers.
7. Refer to Drawings for specific requirements of temporary services and relocated equipment and fixtures.

3.8 CLEAN UP

A. Remove all debris, rubbish, and materials resulting from cutting, demolition, or patching operations from the work area on a daily basis.

B. Transport materials indicated above in approved containers and legally dispose of off site.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, apply to all work of this Division, whether attached or not.

B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

A. All Division 22 sections of these specifications shall include all labor and material to complete the entire mechanical systems as specified and shown on the Drawings.

B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.

C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.

D. Refer to "Conditions of Work" in Division 1

1.3 GENERAL

A. The accompanying Drawings show diagrammatically the sizes and location of the various equipment items and the sizes of the major interconnecting piping and without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions and provide proper grading of lines. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.

B. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 22 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.

C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

D. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.

E. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.

F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.4 EXAMINATION OF THE SITE

A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.

B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.

C. All site visits shall be coordinated and scheduled with the Owner.

1.5 CUTTING AND PATCHING

A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.

B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 22, consulting with the Architect regarding proper locations and sizes.

C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.

D. Holes through concrete shall be drilled with "Mole", "Core-It', or other diamond point hole saw.

E. Refer to Division 01, Cutting and Patching.

1.6 CODE REQUIREMENTS

A. Contractor is required to comply with the requirements of all National, State, and local codes and utility companies having jurisdiction. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.

B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:

1. (NFPA) National Fire Protection Association.

2. (OSHA) Occupational Safety and Health Administration.
3. (NEC) National Electric Code.
4. (IECC) International Energy Conservation Code.
5. Local Plumbing Code.
6. Local Building Code.
7. Local Fire Code.
8. Local Energy Code.
9. Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.7 RECORD DRAWINGS

A. Contractor shall, during the execution of work, maintain a complete set of “Record Drawings” upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Builts" at Project Close- Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.

B. All “Record Drawings” shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.

C. Refer to Division 01, Execution and Close-Out Requirements.

1.8 RECORDS AND INSTRUCTIONS FOR OWNER

A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Division 01, Execution and Close-Out Requirements:

1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.
4. Operating instructions for heating and other plumbing systems. Operating instructions shall include recommended maintenance and seasonal change-over procedures.
5. Other data and drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
7. Valve tag charts and diagrams specified elsewhere herein.
8. "As-Built" Record Drawings shall be provided in electronic format on a CD (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
9. Provide copies of all City Inspection Certificates of Approval.
10. Provide Contractor's Certification Statement that all equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.

B. Provide not less than one (1) day of operating instructions per building, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of all equipment.

C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.

D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all piping, equipment, and materials designated on the Drawings and specified herein. Electronic Pdf copies of each shall be submitted.

B. Contractor shall submit full product data shop drawings and shall prepare and submit 1/4" = 1'-0" scale plumbing piping shop drawings. Contractor shall fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the engineer.

C. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgment of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.

D. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.

E. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.

F. Shop Drawings are not intended to cover detailed quantitative lists of valves, devices, fixtures, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.

G. Shop Drawings prepared to illustrate how equipment, piping, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.

H. Various material submissions of such items as plumbing fixtures, drains, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets for each item submitted shall have sufficient bare space to allow for shop drawing review stamps.

I. Contractor shall process his submitted data to insure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.

J. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents.

K. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.10 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

A. Seal voids around pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 84 00, Fire-Stopping.

1.11 DRAWINGS

A. Drawings show diagrammatically the locations of the various pipes, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.

B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.

D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.

E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.12 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 22.

B. Furnish materials and labor required for the connection of this equipment.

C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.13 COOPERATION

A. Coordinate all work indicated in Division 22 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.

B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.

C. Should any questions arise between work specified in Division 22 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.14 MATERIALS AND EQUIPMENT

A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed.

B. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA

C. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Section 01 60 00, Product Requirements. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.

D. Listed Manufacturers:

1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.

E. Product Options:

1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.
4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

F. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.
5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

G. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by

manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

H. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

I. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.15 STORAGE AND PROTECTION OF MATERIALS

A. Store and protect materials and equipment as specified in Section 01 60 00, Product Requirements.

B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.

C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.16 FOUNDATIONS

A. Provide equipment foundations associated with the work specified in Division 22.

B. All top corners and edges of all foundations shall be neatly chamfered at a one inch (1") high 45 degree angle.

C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.

D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.

E. Unless otherwise noted, foundations shall be four inches (4") thick for plumbing equipment, unless specifically noted otherwise on the Drawings.

F. All concrete work shall conform to the requirements of Division 03, Cast-in-Place Concrete.

G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 22 specifications. Pads shall extend a minimum of two inches (2") in each direction beyond the equipment size.

1.17 EXCAVATION AND BACKFILLING

A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground piping shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall

be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. Installation shall comply with ASTM D2321. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved non-expansive materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.

B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.

1.18 WIRING

A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.

B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.

C. All power for control circuits required for the Temperature Control System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.

D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.

E. All motors furnished as a portion of work specified in Division 22 shall be wired as specified in Division 26.

F. Except where combination starter-disconnects are specified elsewhere herein or in Division 26, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.

G. Furnish all necessary wiring diagrams for equipment specified in Division 22, as a part of equipment submittals, for installation under other sections of these specifications.

1.19 EQUIPMENT STANDARDS

A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.

B. First of a kind new technology devices will not be considered.

C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.20 CLEAN UP

A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.

B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.

C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, ductwork, and equipment.

D. Refer to Division 1.

1.21 FINAL CONSTRUCTION REVIEW

A. Schedule: Upon completion of the work specified in Division 22, there shall be a final construction review of the completed plumbing systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed, tested, adjusted, and balanced in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.

B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.

C. Building plumbing systems shall have been in operation for a minimum of 15 days and Test and Balance work shall be substantially complete prior to this review.

D. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.22 CERTIFICATIONS

A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.

B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.23 GUARANTEE

A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance.

B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.

C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING EQUIPMENT AND PIPING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 22 Sections as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

A. Provide a complete system of Piping Identification as specified herein for each of the systems as described herein.

B. Provide a complete system of valve identification by the use of tags as described herein.

C. Provide a complete system of equipment identification tags as described herein.

1.3 QUALITY ASSURANCE

A. The installation of all mechanical system identification devices shall be performed under this Section of the Specifications using materials which are the product of reputable manufacturers. The application of the materials shall be in strict accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.

B. Manufactured Piping Identification markers, equipment name plates and valve tags shall be a product of Seton Name Plate Corporation, EMED Company, Inc., or Craftmark Identification to meet all ANSI Standards pertaining thereto.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions in accordance with Section 22 05 00.

B. Shop Drawings:

1. Submit a list of all piping systems to be identified, color of background to be used, legend or wording to be displayed for each system, and the intended location of all markers to be displayed.
2. Submit a list of equipment to receive identification tags, cut sheets and proof copies of tags which indicate location of tag and wording to be engraved thereon.
3. Submit a list of valves with location, indicate type of service, type of tag, tag number and proposed valve tag chart as specified herein.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Storage and protection of materials shall be in accordance with Section 22 05 00.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION SYSTEM

A. Furnish piping identification markers for all insulated and uninsulated piping systems in sizes and colors in accordance with ANSI Standard A13.1. Markers shall be as manufactured by Seton Name Plate Corporation similar to their vinyl plastic "Setmark" pipe markers with flow arrows. For systems with overall outside diameters under 6" use the snap-around markers. For systems with overall diameters 6" and over use strap-around markers attached with nylon ties.

B. Markers shall be provided as a minimum for the following systems:

1. Domestic Cold Water (Green background)
2. Domestic Hot Water (Yellow background)
3. Drains (Green background), for all insulated drains not contained in one space or roof; i.e., an A/C condensate drain in a fan room shall not require identification, whereas, as drain extending to another space would.
4. Storm Sewer (Green background)
5. Sprinkler Piping (Red background)
6. Natural Gas (Yellow background)

C. Refer to Section 09900 for color code paint requirements for all exposed mechanical equipment and piping.

2.2 PIPING IDENTIFICATION SYSTEM (ALTERNATE)

A. Furnish a piping identification system for all insulated and uninsulated piping systems as indicated herein. Pre-manufactured markers and plastic wrap-around markers, are allowed.

B. Standardized colors for color bands shall use the following colors which shall be used for the banding of all piping and conduit. The entire natural gas piping system shall be painted per Specifications Section 09900, Yellow - equal to Glidden #73-44.

Domestic Water, Cold, Hot and Hot Water Return, and Softened Water	Blue, or equal to Glidden #77-20
Drain Lines	Black, equal to Glidden #79-61
Fire Sprinkler Water	Red, equal to Glidden #71-76

C. The size of identification lettering and numbers of the material contained in piping and conduits shall be in accordance with the table below. The titles shall be lettered on the color bands indicated above. Upper case letters and Arabic numerals will be used. Where pipes or conduits are too small or not readily accessible for such applications, a brass identification tag will be securely fastened at appropriate locations. Tags shall be at least 1-1/2 inches diameter, with depressed block characters 1/4 inch high. Pipe, band and letter sizes are all in inches.

Outside Diameter of Pipe Covering or Conduit	Width of Color Band	Size of Letters and Numerals
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Over 10	32	3-1/2

D. Each pipe and conduit to be marked by stenciling shall include a flow arrow and identification marking as indicated herein. Piping shall be identified at wall penetrations, machine or tank connections, and at not more than 30 feet intervals. Marker identification should be easily visible from the floor.

Service	Mark
Domestic Water Supply	DOM-W-S
Domestic Hot Water Supply	DOM-HW-S
Domestic Hot Water Return	DOM-HW-R
Domestic 140 Deg.F. Hot Water Supply	DOM-140-HW-S
Domestic 140 Deg.F. Hot Water Return	DOM-140-HW-R
Natural Gas	NAT-GAS
Storm Sewer	STORM
Overflow Drain	OVERFLOW
Sanitary Sewer	SAN
Sanitary Vent	SAN-V

2.3 VALVE TAGS

A. Wire onto the handle of each valve installed a 19 gauge brass disc not under one and one-half inches (1-1/2") in diameter stamped with 1/4" high black paint filled letters over 1/2" high black paint filled numbers. Use "PLBG" as letters for Plumbing Valves, "AC" or "HVAC" for Air Conditioning System Water Valves or "FP" for Fire Protection Valves, followed by an identifying number. Tags shall be equivalent to Seton Style 250-BL.

B. Secure valve tags to valves by use of brass "S" hooks or brass jack chains.

C. The number, location, and purpose corresponding to each valve shall be listed in sequence, properly typewritten on a schedule sheet to be turned over to the Owner.

D. Provide two (2) framed valve tag charts with typed schedule sheets contained therein. Charts shall have an aluminum frame with clear plastic or lexan window.

2.4 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping or utilities. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum in width, color coded for the utility involved with suitable warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Provide for underground natural gas piping systems.

B. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 3 - EXECUTION

3.1 PIPE MARKER INSTALLATION

A. Provide flow arrows at each marker location.

B. Markers shall be spaced not more than 30 feet on center and at each change of direction but not more than 4 feet in each direction from each elbow and tee. Markers not required on piping runouts less than four feet (4') in length and 1-1/4" or smaller in size.

C. Identification markers shall be installed on all new piping; indoors, outdoors and in the crawl space except for drain and waste lines 3/4" and smaller.

D. Install markers on exposed piping systems only after jacketing systems and finish paint coats are complete. Refer to Sections 09 90 00 and 22 07 00.

E. Locations of markers, spacing, and application procedures shall be the same as indicated in Paragraph 3.1B.

3.2 IDENTIFICATION TAG INSTALLATION

A. Secure tags level and in a conspicuous location with adhesive on equipment starters or combination starter disconnects and on the equipment where starters are not immediately adjacent to the equipment served.

B. Additionally, secure all tags with screw fasteners after secured with adhesive.

3.3 VALVE TAGS

A. Secure Valve tags to each valve with Brass "S" hooks or jack chains on each valve stem corresponding to the valve tag chart list.

B. Secure Valve Tag Chart List to Central Mechanical Room wall near the main entry at 60" above finished floor or where otherwise directed by the Architect. Provide second chart to Owner for their disposition.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 22 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

A. Provide the systems of insulation which are specified for the control of heat transfer, sound control, and prevention of condensation.

B. Provide protective devices to prevent compression abrasion or puncture of the piping insulation systems installed to include inserts, pipe shields, PVC jacketing and aluminum jacketing as specified herein.

C. Provide piping identification systems as specified in Section 22 05 53, Identification for Plumbing Piping and Equipment.

1.3 QUALITY ASSURANCE

A. The installation of all thermal insulation shall be performed by a single firm regularly engaged in the insulation business, using skilled insulation mechanics and using insulation materials which are the product of reputable manufacturers. The application of the materials by the insulator shall be in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.

B. Materials shall be manufactured by Schuller, Pittsburg Plate Glass, Owens-Corning, Foster, Certainteed, Mansville, or Knauf.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions to allow review of Materials and Methods to ensure complete compliance with specifications in accordance with Section 22 05 00.

B. Shop Drawings: Submit materials to be used and method of application for each system in tabular form. General statements not specifically identifying means or methods to be used shall be cause for rejection. Include descriptive data and cut sheets on each type of insulation material, sealing method, adhesives used, insert types, shield sizes, and PVC or aluminum jacketing as specified.

C. Submit sample of one inch (1") pipe, minimum 24 inches long, with tee fitting, one ball valve with insulated Tee handle, wye strainer with blow-off valve and one elbow insulated as specified for chilled water systems. Sample shall have one half covered with specified jacketing for exposed conditions and half of this shall be left without a jacket. The elbow and valve shall receive insulation as specified for fittings and valves. This sample shall set the minimum job standards.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Promptly replace all damaged, deteriorated or wet insulation materials.

C. Storage and protection of materials shall be in accordance with Section 22 05 00.

PART 2 - PRODUCTS

2.1 PIPING AND EQUIPMENT INSULATION MATERIALS

A. Domestic Cold and Hot Water Supply, Return, and Non-Potable Water Piping Insulation:

1. Insulation shall be approximately 4 lb. or heavier in density, molded sectional glass fiber pipe covering with factory applied, white FRG, fire resistant, vapor barrier jacket.
2. Insulate valves and fittings with pre-molded glass fiber fitting covers equal in thickness to the adjoining pipe covering. In lieu of pre-molded fitting covers, for welded pipe fittings only, insulate with field fabricated mitered segments of pipe covering equal in density and thickness to the adjoining pipe covering. Use loose low density glass fiber insulation compressed tightly and equal to thickness of adjoining straight pipe sections for screwed fittings; vapor sealed with one 1/8" thick wet coat of water based Foster 30-33, Childers CP-33 vapor barrier coating, or approved equivalent. Vapor barriers- coatings shall have a maximum permeance rating of 0.07 at 43 mils dry film thickness per ASTM E-96, or equivalent adhesive, and imbedded in a glass fabric tape which has an emulsion imbedded in it and a coating on it; apply a second 1/8" thick coat of Foster No. 30-33, Childers CP-33 vapor barrier coating, or equivalent adhesive and apply a PVC jacketing as specified elsewhere herein.
3. Finish entire installation with PVC sheet jacketing where exposed from the finished floor up to 12'-0" above the finished floor including all portions of horizontal piping that occurs at and extends above 12'-0". Jacketing shall be applied to all straight piping sections, as well as all elbows, tees, valves, and fittings. Use "smoke-safe" PVC fitting covers, similar to Speedline 1, Knauf “Proto” or John Manville “Zeston 2000". Suitably seal all jacketing seams with tape, or other approved means, along the entire length of seams.
4. Loose "Diaper" inserts at fittings shall not be allowed.
5. Insulation thickness shall be as follows:

PIPING SYSTEMS	INSULATION THICKNESS - INCHES P I P E S I Z E S				
	RUNOUTS 3/4" & SMALLER	LESS THAN 1"	1" TO 1-1/4"	1-1/2" TO 3"	4" & OVER
Domestic Cold Water	1.00	1.00	1.00	1.00	1.00
Domestic Hot Water, Hot Water Return Water	1.00	1.00	1.00	1.50	1.50
Storm & Overflow Drain	-	-	.5	.5	.5

B. Waste, Drain and Miscellaneous Lines:

1. Insulate the body of each floor and roof drain, where the body of the drain is out of the ground, or above a ceiling, with One-Coat of Insulating Cement, or equivalent, to a 1" thickness and coat with two 1/8" thick coats of Foster No. 30-80, Childers CP-33 vapor barrier coating, or equivalent adhesive, reinforced with an intermediate glass fabric tape saturated with lagging adhesive.

2. Waste lines for E.W.C.'s, floor drains receiving condensate from air handling equipment condensate pans to the point where they join the vertical stack or sanitary main.
3. Primary Roof Drainage System: All horizontal and vertical primary storm drainage piping to the point of penetration to the underfloor. Insulate as described for domestic water lines, except the insulation shall be minimum 1/2" thick (use 1" thick where 1/2" thick is unavailable in the pipe sizes needed). Complete vapor seal shall be required.
4. Overflow Roof Drainage System: The first vertical piece of the overflow drain pipe (below the drain body) and the first horizontal section of overflow drain piping to the first three feet (3') of vertical pipe beyond that section: Insulate as described for domestic water lines, except the insulation shall be minimum 1/2" thick (use 1" thick where 1/2" thick is unavailable in the pipe sizes needed). Complete vapor seal shall be required.

C. Plenum Safe Jacketing:

1. Where non-plenum rated piping (such as PVC, FRPP, PE, PP, etc.) is installed in return air plenums cover all exposed portions of this piping with a plenum safe jacketing, or wrap, system that is a factory manufactured and tested non-combustible barrier, to flame and smoke spread, designed to encapsulate non-rated or combustible items located in return air plenums, in accordance with the most recent additions of the International Building and Plumbing Codes.
2. Plenum safe jacketing shall be covered with a light weight fiberglass reinforced foil scrim finished high temperature rated insulation with an approximate density of 6 pounds per cubic foot. Jacketing shall have a Flame Spread and Smoke Developed rating of 0 for the unfaced blanket and be under 25 and 50 respectively for these items as tested in accordance with U.L. 723 and ASTM E-84. Maximum Flame Spread in accordance with U.L.1887 shall be 0 feet. Maximum smoke/optical density and Average Smoke per U.L.1887 testing shall not exceed 01 and 0 respectively. U.L. 1887 test procedure is a modified tunnel test which provides test data for flame spread and smoke density using a single plastic pipe and a bundle of plastic pipes of various sizes subjected to a fire test.
3. Thermal resistance of the barrier system shall be 4.2 as tested in accordance with ASTM C518. The Barrier System shall be able to withstand an operating temperature up to 2,300 Deg.F. and have a melting point of no lower than 3,100 Deg.F.
4. Plenum safe jacketing shall be a minimum 1/2 inch thick and have at least one side covered with a foil skin which must face the outer, or exposed, side. All joints in each direction shall be overlapped a minimum of one inch (1"). Jacket shall be secured tightly around the piping with either stainless steel banding or stainless steel tie wire. Use stainless steel crimp clamps on banding fasteners. Tie wires shall be secured using twist tensioning. Seal all cut edges with aluminum foil tape to ensure there is no exposed fiber.
5. Plenum safe jacketing shall be as manufactured by:

    a. Great Lakes Textiles, Inc. or approved equals by;
    b. 3M Corporation.
    c. Thermal Ceramics.
    d. FryeWrap by Unifrax.

PART 3 - EXECUTION

3.1 GENERAL

A. Apply insulation and pipe covering after all of the piping system to be insulated has been pressure tested, found to be completely tight (without leaks), and accepted as such. All insulated T-handles, blow-down valves, extended handles and caps should be installed prior to commencing with insulation. Verify that control, isolation, and balancing valves and any other piping specialty where a valve stem or test port extends beyond the normal pipe insulation thickness to be installed is installed pointed upward vertically. Thoroughly clean and dry all surfaces prior to being covered.

B. For operational systems, perform work after operational hours and only during periods of scheduled equipment shutdown. During this period water flow to the piping segments to be insulated shall be stopped and the water and piping shall have equalized in temperature with the average ambient temperature of the space in which the piping is installed. If time does not permit this to occur then apply heat to the piping in a controlled, suitable manner, to warm the water and pipe sufficient to prevent any

condensation from occurring during the insulation process. For any segments to be left uninsulated until the next system shutdown, mastic seal the ends and penetrations through of the installed insulation and allow sealant to dry prior to re-energizing the water system. Continue to insulate the piping system in small enough portions after-hours, or as required, to insure no insulation is applied over a wet surface.

C. In the covering of surfaces subject to low temperatures (below 60 Deg. F.), take extreme precautions to secure a complete vapor seal and avoid air pockets of any kind within the insulation. All insulation shall be tightly fitted to the piping system and all systems shall have an equal thickness and density of insulation around all piping, valves, strainers, accessories, etc. Where fiberglass insulation is cut to contour insulation around valves or strainers add additional insulation to obtain the overall insulation thickness specified. Where vapor barrier jackets are lapped at seams and joints, paste such flaps carefully to assure no break in the vapor seal. Seal around butt joints with strips of vapor barrier jacket. Use self-sealing laps on all insulation for pipes carrying a medium below 60 Deg.F. Stapling will not be permitted where vapor barrier jackets are specified. Vapor barriers for these systems shall have a perm rating not to exceed 0.05.

D. On glass fiber pipe covering with factory applied vapor barrier jacket, lap the jacket on the longitudinal seams and seal with vapor barrier lap adhesive equivalent to water based Foster 30-33, Childers CP-33 vapor barrier coating, or approved equivalent. Vapor barriers - coatings shall adhere to a maximum permeance rating of 0.07 at 43 mils dry film thickness per ASTM E-96. Tightly butt the ends and cover butt joints with a 4" wide band of vapor barrier jacket secured with the same adhesive. At all run-out piping to water equipment mastic seal the ends of the branch piping insulation where it meets the main piping insulation to prevent the migration of moisture should it ever become trapped in the insulation system. Generally, mastic seal the ends of butt joints in water piping systems every 50 feet for the entire system.

E. Where jacketing systems are specified, use standard weight, PVC sheet rolls. Exercise care to locate seams in an inconspicuous place and apply all jacketing neatly, including that on valves and fittings. Unsightly work will be considered a justifiable basis for rejection. Adhere the jacketing in all cases with a lagging adhesive, Foster 30-36 A F (Anti-Fungal) or Childers CP-137 AF, or other approved methods. Lagging adhesives shall meet ASTM D 5590 with a “0" growth rating.

F. All insulation shall be continuous through wall and ceiling openings and sleeves.

G. All insulation and accessories shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

H. No insulation shall be applied to the bodies of unions and flanges on domestic hot water supply and circulating lines only. Terminate the insulation short of the unions or flanges at this equipment, and bevel off at a forty five degree angle to permit "breaking" the union or removal of the flange bolts without damaging the insulation. Bevel the insulation off also at caps on scale pockets, and blow-off connections on strainers, and at valve bonnets on these same systems.

I. Unsightly work shall be cause for rejection, including poor application of adhesives and coatings beyond the insulation which coats valves or other piping specialties.

J. Damage or Modification to Insulation: Where new insulation is disturbed or damaged during the process of installing other new materials, making new connections, etc., it shall be repaired or replaced to return it to its original condition and appearance. Where lines are removed and connections to insulated lines are capped, insulate those caps as well as repairing damaged insulation. Materials shall match those presently installed in thickness, density, insulating value, jacketing, etc.

K. Miscellaneous Lines: Piping connected to water lines through which there might be fluid flow on occasions such as the lines connected to air vents, lines running to compression tanks, etc. shall be insulated as described for other piping in those systems.

L. Hanger and Support Locations: At the location of hangers or supports for pipes run above ground and finished with a vapor seal insulation, provide rigid sections of cork, Foamglas, calcium silicate or high density polyurethane, at least the same thickness as the adjacent insulating material to adequately support the pipe without compression of the insulating material and cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the lines. Where the insert has an insulating value less than the adjacent pipe insulation the thickness of the insert shall be increased to equal the insulating value of the adjacent pipe insulation. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall be installed exterior to the insulation.

M. Material Changes: Wherever there is a change in materials on lines that are vapor sealed, apply a suitable adhesive that is compatible with both materials, tapes, etc., as required to maintain the vapor barrier.

N. The following describes materials, thickness and finishes for insulation on piping. In the following "exposed" shall mean any pipe exposed below the finished ceiling and structure where no ceiling is installed, in any room space, area, mechanical rooms, closets, and any pump run exterior to the building, including above the roof. "Concealed" shall mean any pipe located above ceilings, in furrings, in chases, in crawl spaces, and buried in direct contact with the soil.

O. In all "exposed" areas, up to 12'-0" above the finished floor, insulation shall receive a PVC jacketing system. Neatly install all jacketing for finish painting.

P. All insulation materials and jacketing shall exhibit the following characteristics:

1. Water sorption, per ASTM C 1104, shall be less than 0.02%.
2. Linear shrinkage, per ASTM C 356, shall be negligible.
3. Stress corrosion, per ASTM C 795, shall not cause corrosion.
4. Corrosiveness, per ASTM C 665, shall not be any greater than sterile cotton.
5. Resistance to fungi, mold and mildew and bacteria, per ASTM C 665, shall be rated as not promoting growth of fungi and bacteria. Inhibitors shall be added to specified products to meet these requirements.

3.2 SHIELDS AND INSERTS

A. Metal saddles, shields, shall be applied between hangers or supports and the pipe insulation. Saddles shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for hanger inserts. Shields shall be made of galvanized sheet metal and shall be of sufficient size and length to prohibit the crushing of the insulation materials. Saddle shields shall be as follows:

Pipe Size	Metal Saddles	
	Metal Gauge	Length
3/4" to 3"	18	12"
4" to 6"	16	12" - 18"
8" to 10"	14	24"
12" & Larger	12	24"

B. Provide inserts of calcium silicate on hot piping and cellular glass or 7#/Cu.Ft. fiber glass pipe insulation on cold piping at hangers except pipes 1-1/2" or smaller in size. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:

Pipe Size	Insert Length
3/4" to 3"	12"
4" to 6"	12" - 18"
8" to 10"	24"
12" & Larger	24"

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 01 - General Requirements and referenced documents.

B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide a complete system of domestic hot and cold water supply as indicated herein and as illustrated on the contract drawings.

B. Provide isolation of systems through valving as shown or indicated herein.

C. Provide a system free of water hammer.

D. Isolate all piping components to eliminate all audible vibration and noise.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.

C. Product Data:

1. Pipe.
2. Fittings.
3. Joining methods.
4. Shock arrestors.
5. Backflow preventers.
6. Trap Primer.

D. Certification: Submit certification that completed system complies with sterilization procedures and test requirements of municipality, State, and other public authorities having jurisdiction over system sterilization.

E. Submit copies of pressure test data of water systems to Owner prior to time of final completion of construction work.

F. Provide closeout documents as required in Division 1, Section 01 17 00.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing.
2. Provisions specified in this Section.
3. Local Plumbing Code.

B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Above ground:

1. 4 Inch and Smaller:

a. Pipe: Hard drawn copper water tube, ASTM B88, Type "L".
b. Fittings:

1) 4 Inch and smaller, wrought copper solder joint fittings, ANSI B16.22.

c. Joint solder:

1) 95% tin - 5% antimony for pipe sizes 2" and less.
2) Or 95.5% tin, 4% copper and 0.5% silver based for pipe sizes 2" and less.
3) "Silfos" for pipe sizes 2-1/2" and larger.
4) No lead containing solder is allowed.

d. Alternative Joint method:

1) Zero Lead Press Joints, copper & copper alloy press fitting shall conform to material requirements of ASME B16.18 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM and shall be factory installed with a leakage path feature that will assure leakage of liquids from inside the engineered system past the sealing element of an unpressed connection. Acceptable manufactures: Viega, Nibco or Mueller

B. Unions:

1. 4 Inch and Smaller: ANSI B16.22 wrought copper; solder end fittings.
2. Over 4 Inch: ASTM A 177, 150 LB. galvanized iron, screwed; brass to iron ground joint. Provide dielectric isolating unions at all junctions or connections between metallic piping of dissimilar metal.

C. Valves and Supports: Provide lead-free bronze full-port ball valves with stainless steel trim for pipe sizes 2" and smaller. Provide flanged lead-free bronze or epoxy coated full port valves with stainless steel trim from pipe sizes 2-1/2” or larger. Butterfly valve are not allowed. Refer to Section 22 05 00 and 22 21 13, Basic Materials and Methods.

2.2 SPECIALTIES

A. Access Doors:

1. Milcor "Style K, M, or DW", stainless steel to suit surface application.
2. Panels to have cam locks and door sized 16 inches by 16 inches
3. All restroom/toilets and kitchen areas shall have stainless steel access doors.

B. Shock Arrestors:

1. Acceptable manufacturer: Sioux Chief Manufacturing Co., Precision Plumbing Products (PPP), Josam, Jay R. Smith.
2. One piece, seamless copper construction.
3. Piston type, triple "O" ring copper construction.
4. Factory charged.
5. Plumbing Drainage Institute (PDI) certified.
6. ASSE 1010 approved with lifetime warranty, not requiring access.
7. Size as shown on drawings or as recommended by manufacturer.
8. Acceptable product: "Hydra-Rester", Sioux Chief Manufacturing Co.

C. Air Chambers: Same material and size as pipe branch or riser; minimum of 18" long.

D. Vacuum Breakers:

1. Acceptable manufacturer:
    a. Watts.
    b. Febco.
    c. Beeco.
2. Atmospheric, check valve type.
3. Bronze body construction with polished chrome finish.

E. Reduced Pressure Type Backflow Preventer Assembly:

1. Acceptable manufacturers:
    a. Watts.
    b. Beeco.
    c. Ames.
2. Double check valve type with shutoff valves.
    a. Quarter turn ball shut-off valves up to 2-1/2 Inches.
    b. Outside stem and yoke gate shut-off valves 3 Inches and over.
3. Differential pressure type relief valve with air gap fitting.
4. Lead-Free bronze body construction up to 2-1/2 Inches.
5. Cast iron body construction 3 Inches and over.
6. Provide in-line upstream y-type strainer.
    a. 20 mesh strainer 2 Inches and below.
    b. 0.125 perforated screen mesh 2-1/2 Inches and over.
7. Acceptable Product: Watts No. 909S (FDA)-QT.

F. Double Check Backflow Preventer Assembly:

1. Acceptable manufacturers:
    a. Watts.
    b. Beeco.
    c. Ames.
2. Double check valve type with shutoff valves.
    a. Quarter turn ball shut-off valves up to 2-1/2 Inches.
    b. Outside stem and yoke gate shut-off valves 3 Inches and over.
3. Lead-Free bronze body construction up to 2-1/2 Inches.
4. Cast iron body construction 3 Inches and over with stainless steel internal ports and FDA approved fused epoxy coating.
5. Provide in-line upstream y-type strainer.
    a. 20 mesh strainer 2 Inches and below.
    b. 0.125 perforated screen mesh 2-1/2 Inches and over.
6. Acceptable Product: Watts No. 709S (FDA)-QT.

G. Pressure Reducing Valve Assembly:

1. Main water Service Valve: Watts No. ACV-115 pilot operated pressure reducing valve with modified globe design, fused epoxy surfaces inside and out, Type 316 stainless steel stem and Bune "N" diaphragm.
2. Small Bypass Valve: Watts No. 223-S with strainer.

3. Size of valves shall be as noted on the Drawings. Equivalent valves by Cla-Val, Spence and Beeco will be considered.

H. Non-Freeze Roof Hydrant: 3/4" NPT male brass nozzle hose thread freezeless roof hydrant with 304 stainless steel shroud and base, 125 pound 7" globe angle valve, quick disconnect with built-in vacuum breaker, under deck flange, drain down reservoir utilizing the “Venturi Principle”, and black powder coated cast aluminum weather-guard dome handle. MAPA Model MPH-24FP.

I. Trap Primer:

1. Automatic Trap Primer shall be designed to deliver potable water to floor drains. The trap primer shall operate with a line pressure drop of 5 to 10 psi. Trap primer shall be diaphragm operated to work on line pressure drops and spikes to automatically maintain a constant water seal in P-traps. Where required by Local Authorities Having Jurisdiction, provide indirect connection between automatic trap primers and trap primer line that connects directly to drain body or p-trap.
2. TP-1: Precision Plumbing Products, Inc., Model "CPO-500" with proper distribution unit as shown on floor plan and/or riser diagrams.
3. TP-2: Trap primers serving floor drains in restrooms shall be served off the ADA water closet automatic flush valve, with a Sentinel (24 hour) flush, Precision Plumbing Products, Inc., Flush Valve Primer Model FVP-1VB.
4. TP-3: Trap primers serving floor drains in all other spaces shall be solenoid operated, with proper distribution unit where required. Precision Plumbing Products, Inc., Mini-Prime Electronic Trap Primer Model MP-500 (115V/24V/220V). Coordinate electrical connection to solenoid.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's recommendations.

B. All piping shall be properly cleaned and reamed to the full inside diameter of the pipe size prior to joining.

C. Connections to Equipment:

1. Install necessary pipe connections and fittings required to connect equipment.
2. No rough-in shall be done before drawings of equipment are received.
3. Make all final connections to include unions or flanges to facilitate future removal.
4. Install cutoff valves on equipment connections.

D. Install shock arrestor ahead of each quick closing valve, at top of each riser and on pipe run to water closets as recommended by manufacturer. Shock arrestors shall be accessible as required by Local Codes.

E. Install backflow preventers at connections to closed mechanical water system makeup such as chilled water and hot water systems and beverage dispenser connections as required by Local Codes.

F. Pressure reducing valve assembly shall be installed as required when city water supply pressure exceeds 80 psig at the building domestic water header.

G. Trap Primer Lines cast in concrete floor or below slab shall be continuous Type "K" copper tubing. No joints shall be allowed below floor. Insulate copper tubing with 1/2" insulation below slab, polywrap copper tubing, or provide approved coating to prevent contact between copper and concrete when cast in floor or structure. Slope trap primer line continuously. No piping shall be cast in structural members unless noted on plans and approved by Structural Engineer.

H. Strictly coordinate locations of wall clean out cover plates and access doors. Submit locations to the Architect prior to installation for final approval.

3.2 FIELD QUALITY CONTROL

A. Testing:

1. Furnish instruments, equipment, and labor necessary to conduct tests.
2. Methods of sampling, inspecting, and testing shall conform to local codes.
3. Tests of plumbing systems:
    a. Plumbing piping systems shall be pressure tested.
    b. Underground piping shall be tested and successfully repaired prior to backfilling.
4. Water Systems:
    a. When rough-in is completed and before fixtures are set, entire hot and cold water and piping systems shall be tested at hydrostatic pressure of not less than 100 psig, and approved tight at this pressure for not less than 30 minutes.
    b. Where portion of water piping system is to be concealed before completion, portion shall be tested separately as specified for entire system.
5. Domestic hot water circulating system: Balance and check prior to final inspection and provided with sufficient thermometers installed at time of final construction review to prove that water is circulating in all piping loops to fixtures.
6. Defective work:
    a. If inspection or test shows defects, defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated.
    b. Repairs to piping shall be made with new materials.
    c. No caulking of screwed joints or holes will be acceptable.

B. Disinfection:

1. After pressure tests have been made and leaks repaired, flush entire domestic water distribution system with water until entrained dirt and mud have been removed.
2. On the building side of each water meter assembly, provide a minimum 3/4 inch connection for injection of sterilizing fluid to disinfect the piping system chlorinating materials utilizing liquid chlorine or calcium hypochlorite shall be used.
3. Provide dosage of not less than 50 parts per million.
4. Retain treated water in pipe long enough to destroy all non-spore forming bacteria.
5. Retention time shall be at least 24 hrs. and shall produce not less than 10 ppm of chlorine at extreme end of system at end of retention period.
6. Open and close valves in system being disinfected several times during contact period.
7. Flush system with clean water until residual chlorine is reduced to less than 1.0 ppm versus 0.2 at the most remote fixture.
8. During flushing period, open and close valves and faucets several times at several locations.
9. From several points in system, take samples of water in properly disinfected containers for bacterial examination.
10. Repeat disinfecting until satisfactory bacteriological results have been obtained and City Health Dept. has made final approval of test.

3.3 ADJUSTING AND CLEANING

A. Equipment, pipes, and valves shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from operation of system during test.

B. Stoppage, discoloration, or other damage to finish, furnishing, or parts of building, due to failure to properly clean piping system, shall be repaired.

C. When work is complete, adjust hot water systems for uniform circulation.

D. Adjust flush valves and automatic control devices for proper operation

END OF SECTION

SECTION 22 11 23

NATURAL GAS PIPING SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

C. Comply with Local Governing Gas Codes, and the requirements of the Authorities Having Jurisdiction.

1.2 SYSTEM DESCRIPTION

A. Provide a complete natural gas piping system as indicated herein and as illustrated on the contract drawings.

B. Make connections to water heaters, HVAC equipment, kitchen equipment or other devices as specified here or as shown on the drawings.

C. Provide gas cocks, pressure regulators, dirt legs, valves and unions or other devices as indicated and as required by the local authorities having jurisdiction.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.

C. Product Data:

1. Pipe.
2. Fittings.
3. Joining methods.
4. Valves.
5. Clean Gas pressure regulators.
6. Vents.

D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.

E. Provide closeout documents as required in Division 1.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
2. Provisions specified in this Section.
3. Applicable provisions of standards of National Fire Protection Association (NFPA).
4. Applicable provisions of standards of American Gas Association (AGA).
5. Local Plumbing Code and Gas Code.
6. Local Gas Utility Requirements.

B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 - PRODUCTS

2.1 ABOVE GROUND PIPE AND FITTINGS

A. Pipe: ASTM A53, Grade A or B, seamless, Schedule 40, standard weight black steel.

1. 2 Inches and Smaller: Threaded and coupled.
2. 2-1/2 Inches and Larger: Butt welded joints
3. All gas piping in sleeves shall have welded joints, regardless of size.

B. Fittings, 2 Inches and Smaller: ASTM A197, 150 LB black malleable iron, screwed joint. Piping system with pressure of 2 psig or greater shall have socket welded joints for all sizes.

C. Fittings, 2-1/2 Inches and Larger: ASTM A234, WPB standard weight, weld joint fittings.

D. Unions, 2 Inches and Smaller: ASTM A197, 150 LB, black malleable iron, screwed joint, brass to iron ground joint.

E. Flanges:

1. Use for 2-1/2 Inches and larger pipe.
2. ASTM A181, Grade 1, 150 LB, flat faced, weld neck.
3. Gaskets:

a. Acceptable manufacturers:

1) Manville.
2) Cranite.

b. 150 LB, 1/16 Inch full-faced, punched sheet, 650 Deg.F. rating suitable for gas service.
c. Bolting: ASTM A307, Grade B, heavy hex head machine bolt with heavy hex nuts.

2.2 VALVES

A. Acceptable Manufacturers:

1. SMG Global
2. Milwaukee
3. Hammond
4. McDonald.

B. Valves: 125 LB iron cocks, flat head, non-lubricated plug with resilient double seal, screwed ends or flanged, for natural gas service.

C. Acceptable Product: "Series 400", Key Port valve by SMG Global with RS49 (HYCAR) plug seals, U.L. listed for natural gas shut-off.

2.3 GAS PRESSURE REGULATORS

A. Acceptable Manufacturers:

1. Rockwell/Equimeter.
2. Fisher.
3. Sensus.
4. Itron

B. Regulators:

1. Adjustable type, with automatic loading.

2. Provide with automatic pressure relief.
3. Provide means for removing and renewing valve.
4. Adjust for outlet pressure required.
5. Outlet pressure shall not vary more than 1/2 inch water column from setting point at connected load capacity for regulator.

C. Pressure Relief: Diaphragm operated, spring loaded type with vent for relief of excess pressure on low pressure side of each main service regulator.

D. All equipment shall be furnished with final regulator.

E. Regulators shall have bugproof screened vent cap installed in vent tapping.

F. When regulators are installed inside the building and venting of the regulator is required, extend the vent full size to the outside and terminate vent with a gooseneck with a bugproof screen.

G. Acceptable Product: Rockwell Model 143, 243 or 121 as determined by inlet and outlet pressure, pipe size and CFH capacity.

H. Provide secondary regulators at individual equipment connections where required to deliver manufacturer's recommended delivery pressure to equipment.

2.4 ROOF GAS PIPE SUPPORTS

A. Pipe supports shall have galvanized or stainless steel adjustable height hard cast rubber roller w/ nylon bushing pipe supports for all roof top utility lines. Refer to manufacturer's recommendations for spacing and appropriate pipe support size of pipe. provide, as a minimum supports as follows:

1. Within 3'-0" of all equipment connections
2. Within 2'-0" of each change in direction, elbow & tee.
3. Not more than every 10'-0" on centers beyond those indicated above..

B. Provide Mapa model MS-5 or equal by Erico or Miro

C. Provide with Traffic Pad, Mapa model WP1016.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Cap or plug pipe openings during installation.

B. Cover and protect piping, fixtures and equipment against dirt, water, weather, and chemical or mechanical injury.

C. Run Piping Concealed and Sleeved in Finished Rooms unless Indicated Otherwise:

1. Terminate lower end of vertical supply piping near burners or equipment connections.
2. Terminate with tee, nipple, and cap to serve as dirt trap.
3. All final equipment connections shall consist of a union and shut-off valve.

D. Threaded Joints:

1. Taper threads and cut evenly; make with graphite and oil.
2. After cutting and before threading, ream pipe to remove burrs.
3. Use appropriate pipe joint thread compound.
4. Caulking of threaded joints after joining to stop or prevent leaks will not be permitted.

E. Welded Joints:

1. Fusion-weld in accordance with ANSI B31.8, make changes in direction of piping with welding fittings only.
2. Mitering or notching pipe to form elbows and tees will not be permitted except for sleeves as indicated elsewhere herein.
3. Make branch connections with welding tees or forged welding branch outlets except for sleeves as indicated elsewhere herein.

F. Beveling:

1. Make field and shop bevels by mechanical means or flame cutting.
2. Where beveling is done by flame cutting, clean surfaces of scale and oxidation prior to welding.

G. Alignment:

1. Before welding, align component parts to be welded so no strain is placed on weld when finally positioned.
2. Set flanges and branches true.
3. Maintain alignment during welding operation.

H. Make final connection to equipment using rigid pipe and fittings.

I. Piping on roof:

1. Piping shall be supported on roof supports furnished and installed under Division 07 of the Architectural specifications and as recommended by the roofing manufacturer at a spacing not to exceed 10'-0" on center and within 3'-0" of each equipment connection or branch pipe.
2. Offset pipes to be 8" minimum above the roof at all expansion joints, roof penetrations, perimeter gravel stops/fascia and vertically flashed surfaces.
3. Unless noted otherwise, bottom of pipe shall be minimum of 4" above roof or roof ballast.
4. Do not secure piping to supports unless detailed otherwise.
5. Exposed piping shall be coated with red primer and a minimum of two coats of paint. Preparation of piping and painting shall comply with other applicable sections in Division I.
6. Pipe installer shall determine exact layout of piping and locate all required supports.

3.2 FIELD QUALITY CONTROL

A. Set up in accessible position, where directed, test pump and mercury gauge connected to permanent gas piping.

B. Protect pump and gauge and keep in working order until after final inspection.

C. Remove as directed.

D. Before appliances are connected, piping systems shall withstand a test pressure of 150 percent of the maximum working pressure or 30 PSIG, whichever is greater, for a period of not less than one (1) hour without showing a drop in pressure.

E. Pressure calibrated instruments shall read in increments of not greater than 0.1 LB when measured with mercury manometer or slope gauge.

F. Pressurize system, then isolate source of pressure before pressure tests are made.

G. Test gas piping with dry air only.

H. If test fails, repair all leaks and retest until the test passes.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 01 - General Requirements and referenced documents.

B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide a complete sanitary waste and vent system as indicated herein and as illustrated on the contract drawings.

B. Provide trap primer connections on floor drains or other devices as indicated and as required by the local authorities having jurisdiction.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.

C. Product Data:

1. Pipe.
2. Fittings.
3. Joining methods.
4. Floor drains.
5. Clean outs.

D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.

E. Provide closeout documents as required in Division 1, Section 01 70 00.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
2. Provisions specified in this Section.
3. Local Plumbing Code.

B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Above ground:

1. Cast Iron Piping:
    a. Pipe 1-1/2 Inches through 10 Inches: CISPI 301, or ASTM A888, service weight, no hub cast iron pipe, coated with coal tar pitch.
    b. Fittings 1-1/2 Inches through 10 Inches: CISPI 301, or ASTM A888, service weight, no hub cast iron fittings with coal tar pitch coating.
    c. Pipe 12 Inches and larger: ASTM A74, service weight, cast iron, single hub, coated with coal tar pitch.
    d. Fittings 12 Inches and larger: ASTM A74, service weight, cast iron, hub and spigot fittings, coated with coal tar pitch.
    e. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be NSF Internationally listed.
2. Cast Iron Soil Pipe Joints:
    a. Pipes with hubs: Provide neoprene compression gasket seals ASTM C564.
    b. Hubless pipe: Provide 28 gauge stainless steel shield and clamp assembly over one piece neoprene sealing sleeve, Clamp-All “HI-TORQ 80", or Husky SD-2000.
3. Schedule 40 PVC Piping Above Grade:
    a. Pipe 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, drain waste vent (DWV) pipe, ASTM D2466, ASTM D 2321, ASTM D2665 and ASTM 1785, NSF stamped and approved. System shall be rated for 200 psi minimum pressure.
    b. Fittings 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, DWV patterned fittings, ASTM D2466 and ASTM 1784, NSF stamped and approved.
    c. Solvent Cement: Shall comply with pipe and fitting manufacturer’s recommendations and shall be a two (2) step process with Primer manufactured for thermoplastic piping systems and solvent cement per manufacturer and shall conform to ASTM D2564 and ASTM F656.
    d. Anywhere non-plenum rated pipe is installed in return air plenums, all exposed portions of this pipe shall be covered with a plenum safe jacketing, or wrap, system per Insulation Specification 22 07 00 or use cast iron piping as specified above.
    e. PVC pipe material shall not be allowed to serve fixtures, drains, or equipment subject to receiving fluids with temperatures of 140 Deg.F. or higher. Provide cast iron service weight pipe and fittings as specified above and extend a minimum of 20' (twenty feet) or to main waste line to assure high temperature cools in cast iron pipe before entering PVC piping material.

B. Below Slab or Grade:

1. Pipe, all sizes: ASTM A74, service weight, cast iron, single hub.
2. Fittings, all sizes: ASTM A74, service weight, cast iron, hub and spigot fittings.
3. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be NSF Internationally listed.

C. Schedule 40 PVC Piping Below Grade:

1. Pipe 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, drain waste vent (DWV) pipe, ASTM D2466, ASTM D 2321, ASTM D2665 and ASTM 1785, NSF stamped and approved. System shall be rated for 200 psi minimum pressure.
2. Fittings 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, DWV patterned fittings, ASTM D2466 and ASTM 1784, NSF stamped and approved.
3. Solvent Cement: Shall comply with pipe and fitting manufacturer’s recommendations and shall be a two (2) step process with Primer manufactured for thermoplastic piping systems and solvent cement per manufacturer and shall conform to ASTM D2564 and ASTM F656.
4. Anywhere non-plenum rated pipe is installed in return air plenums, all exposed portions of this pipe shall be covered with a plenum safe jacketing, or wrap, system per Insulation Specification 22 07 00 or use cast iron piping as specified above.

5. PVC pipe material shall not be allowed to serve fixtures, drains, or equipment subject to receiving fluids with temperatures of 140 Deg.F. or higher. Provide cast iron service weight pipe and fittings as specified above and extend a minimum of 20' (twenty feet) or to main waste line to assure high temperature cools in cast iron pipe before entering PVC piping material.

2.2 CLEANOUTS

A. Acceptable Manufacturers:

1. Model numbers specified are products of Jay R. Smith, unless otherwise specified.
2. Other acceptable manufacturers:

a. Josam.
b. Wade.
c. Zurn.
d. Watts.
e. MIFAB.

B. Size: Same size as pipe up to 4 Inches; 4 Inch for 4 Inch and larger pipe.

C. Cleanouts for Cast Iron Pipe: Tapped extra heavy cast iron ferrule, caulked into cast iron fittings.

D. Cleanout Plugs:

1. Meet requirements of Plumbing Code, with American Standard pipe threads.
2. Taper thread bronze plug.
3. Or neoprene gasket seal ABS plug.

E. Cleanouts do not require special covers on lines in completely accessible pipe chases or in equipment rooms where piping is exposed.

F. Pipe Fittings at Cleanouts: Make cleanouts turning out through walls and up through floor by long sweep ells or "Y" and 1/8 bends.

G. Cleanout Cover Plates:

1. Provide face or deck plates for concealed cleanouts to conform to architectural finish in room.
2. Where no definite finish is indicated, wall plates shall be stainless steel and floor plates Nickel Bronze.
3. Provide vandalproof screws.

H. Acceptable Products:

1. In floor with Linoleum tile or vinyl tile finish:

a. Round Nickel Bronze top.
b. Scoriated top.
c. Smith No. 4051L-NB-U.

2. In floor with ceramic tile finish:

a. Square Nickel Bronze top.
b. Scoriated top.
c. Smith No. 4051L-NB-U,

3. In finished rooms flush with wall:

a. Vandal Proof Stainless Steel Center screw.
b. Cleanout tee with Stainless Steel Round Cover.
c. Smith No. 4530Y-SS-U.

4. In fan or mechanical room floors with concrete finish and/or with floating floors:
    a. Round Nickel Bronze Extra Heavy Duty top.
    b. Secured Scoriated top.
    c. Smith No. 4111L-NB-U.
5. In floors with carpet:
    a. Continuous Carpet: Round Nickel Bronze top with Nickel Bronze Carpet Clamping Device (-X).
    b. Carpet Squares: Round Nickel Bronze Scoriated top below carpet with screwed Stainless Steel Carpet Cleanout marker (-Y).
    c. Smith No. 4031L-Y-NB-U or 4031L-X-NB-U.
6. For terrazzo floor finish:
    a. Round Nickel Bronze top.
    b. Scoriated top.
    c. Smith No. 4051L-NB-U.
7. Exposed Stack:
    a. Duco Coated Cast iron cleanout "tee".
    b. Gasket Sealed countersunk bronze plug.
    c. Smith No. 4511S-Y-U.
8. Underfloor Chase:
    a. Cast Iron Cleanout body.
    b. Gasket Sealed countersunk bronze plug.
    c. Smith no. 4293L-U.
9. Vehicle Traffic Outside Grade:
    a. Duco Coated Heavy Duty Cast Iron Round Cleanout Housing.
    b. Soriated Cast iron Cover with Lifting Device.
    c. Vandalproof screws.
    d. Cast iron cleanout ferrule and Gasket Seal Bronze Plug.
    e. Smith No. 4262L-U.
10. Grade:
    a. Duco Coated Extra Heavy Duty Cast Iron Top.
    b. Installed in concrete block 18" x 18" x 6", or surround each cleanout with a minimum of four inches (4") of concrete by six inches (6") thick, top of block shall be flush with finished grade.
    c. Smith No. 4232L-U.

2.3 DRAINS

A. Acceptable Manufacturers:
1. Josam.
2. Jay R. Smith.
3. Wade.
4. Zurn.
5. Watts.
6. MIFAB.

B. P-traps:
1. Provide floor and equipment drains with cast iron P-traps.
2. Provide deep seal traps where indicated, or as required.

C. Trap Primer Connections: Where indicated or shown on the drawings provide a trap primer connection on the body on the P-trap of each drain of the size indicated.

D. Clamping Collars: When installed with waterproofing membrane, or shower pans, provide floor drains with clamping collar.

E. Floor Drains/Sinks:

1. Floor Drain "FD-1" - For Finished Areas: Smith No. 2005-A06NB-U, cast iron body with cast iron collar, adjustable six inch (6") round secured satin finish bronze strainer, vandalproof screws, and bottom outlet. Provide Smith No. 3510-F1107NB cast iron body and cast iron collar, adjustable seven inch (7") round nickel bronze strainer, and four inch (4") round nickel funnel for drains that receive indirect waste piping from equipment or fixtures. Provide six inch (6") square top strainer size for Square Ceramic Tile Floors. Smith No. 2005-B06NB.
2. Floor Drain "FD-2": Smith No. 2350 Duco coated cast iron body floor drain, adjustable eight point five inch (8.5") round top, loose set anti-tilting grate, perimeter drainage slots, flashing collar with weepholes, bottom outlet, and suspended sediment bucket. ProvideSmith No. 3650-B cast iron body with cast iron grate and collar six inches (6") round grate and 9" x 3-1/2" cast iron funnel for drains that receive indirect waste piping from equipment or fixtures.
3. Floor Drain "FD-3": Smith No. 2253C cast iron body and collar, 45 square inches free area, 14 inch (14") round, cast iron tractor grate and slotted sediment bucket to be used in high volume drainage area.
4. Floor Drain "FD-4": Smith No. 3101Y cast iron flanged body with acid resistant coated interior and sediment bucket, provide with secured nickel bronze grate and rim.
5. Floor Sink "FS-1": Smith No. 3151Y cast iron body flanged floor sink with acid resistant coated interior and sediment bucket, minimum eight inches (8") deep, twelve inch (12") square top, double drainage flange, weepholes, bottom outlet, Nickel Bronze Rim and Secured Nickel Bronze 3/4 grate.
6. Hub Drain (H.D.): Set cast iron bell flush with finished surface, unless otherwise noted.
7. Floor Drain - “FD-5" - Kitchen Floor Drain: Smith No. 9725-C 8.5" round stainless steel body with flashing clamp, adjustable anti-tilt stainless steel grate and rim, trap primer connection.

F. Trap Guards: Acceptable Manufacturer: ProSet Systems, Inc., or Jay R. Smith

1. Description:

a. Material: Smooth, soft, flexible, elastomeric PVC molded material molded into shape of duck’s bill, open on top with curl closure at bottom.
b. Allows wastewater to open and adequately discharge floor drain through its interior.
c. Closes and returns to original molded shape after wastewater discharge is complete.

2. Compliance:

a. ASME A112.6.3.
b. NSF/ANSI 14.
c. CSA B 79.

2.4 VENT PIPE ROOF PENETRATION FLASHING

A. Flash each vent pipe roof penetration as recommended by the roofing system manufacturer as specified under other sections of the specifications.

B. Where vent pipes pass through the roof and no indication is made elsewhere in other sections of the specifications as to flashing requirements, use 4 lb. per Sq. Ft. minimum; seamless sheet lead rolled over the vent pipe to counter flash pipe.

C. When lead flashing is required under the conditions noted in the above paragraph comply with the following:

1. 24 Inches square minimum size at base of lead flashing.
2. 8 Inches minimum clear on all sides of pipe.

D. Install vandalproof vent caps similar to Smith No. 1748 to be the same size as vent pipes passing through the roof.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Each plumbing fixture shall be individually trapped and vented with vent and waste stacks full size throughout.
2. Install reducers, increasers, special flanges and fittings between piping and fixtures for complete installation, ready for use.
3. Make offsets necessary to avoid construction interferences.
4. Connect plumbing fixtures, drains, appurtenances, and appliances to receive or discharge liquid waste or sewage to sanitary waste system in accordance with requirements of local codes.
5. Protect seal of fixture trap in plumbing system with properly installed vent.
6. Coordinate floor drain locations with Drawings and other trades.
7. Manhole covers shall be sealed gas tight. Provide gasketted seal as recommended by manufacturer.

B. Slope:

1. Slope horizontal drainage lines 2 inches and smaller 1/4 In per foot toward main sewer.
2. Slope 3 inch and larger drainage lines 1/8 inch per foot
3. Horizontal drain lines shall be run in straight lines uniformly sloped.
4. Make changes in direction of flow of horizontal lines with wye and 1/8 bends.

C. Vents:

1. Extend vents above roof without reduction in size and terminate not less than 25 feet away from shaft, windows, or ventilating air intake openings.
2. All vent and branch vent pipes shall be graded and connected to drip back to sanitary waste pipe by gravity.
3. Extend vent lines at least 6 inches above flood level rim of vented fixture before offsetting.
4. Extend all vents minimum of 18 inches above roof.
5. Offset vents in outside walls to penetrate roof at least 18 inches from outside walls.
6. Extend roof vent flashing onto roof surface minimum of 8 inches on all sides in accordance with the roofing system manufacturer's recommendations.
7. Coat metal sheet flashing with bituminous mastic where in contact with mortar or concrete to prevent direct contact with masonry materials.

D. Traps:

1. Equip each fixture, floor drain or piece of equipment connected to sanitary waste system with a trap.
2. Plumbing fixtures, except those having integral traps, shall be separately trapped by water seal P-traps placed as close to the fixture outlet as possible.
3. Provide trap with cleanout.
4. No fixture shall be double trapped.

E. Cleanouts:

1. Cleanouts shall be installed per plumbing code in addition to those locations identified below.
2. Install in each change of direction greater than 90 degrees, at end of lines, base of risers, and other points necessary to permit cleaning of pipe sections.
3. Wall cleanout shall be provide on individual sinks, lavatories, and electric water coolers.
4. Cleanouts shall be readily accessible.
5. Extend cleanouts on concealed piping through and terminate flush with wall, floor, or grade. Strictly coordinate cleanout cover plate location with the Architect for approved locations prior to pipe installation.

6. Wall cleanouts shall be provided at restrooms, at a minimum, at the beginning and end of the chase wall Cleanouts located at water closets shall be set 12” above the flood rim of the water closet. Cleanouts located at urinals shall be set 6” above the flood rim of the urinal.
7. Provide additional cleanout as indicated in the documents and/or as required by owner and local AHJ.
8. Space cleanouts not more than 50 feet apart for 3 inch pipe or less and not more than 100 feet apart for 4 inch and larger pipe.
9. If local requirements are more stringent than those indicated herein then those shall govern.
10. Cleanouts located at restroom batteries and/or at water closets shall be installed 12 inches above the flood rim of the water closet.

F. Drains:

1. Install floor, area, and equipment drains flush in the floor or basin to be drained unless indicated otherwise.
2. Locate drains in mechanical equipment spaces to conform with drain locations of equipment furnished.
3. Coordinate drain locations for Food Service equipment with rough-in drawings for such.
4. Coordinate with other trades to insure floors are sloped toward floor or area drains to provide positive drainage.

G. Coordinate installation of vent flashing for all roof penetrations with other sections of the specifications.

3.2 FIELD QUALITY CONTROL

A. Furnish instruments, equipment, and labor necessary to conduct tests.

B. Test underground soil and waste piping before backfilling.

C. Test drainage, waste, and venting piping with water before fixtures are installed.

D. After plumbing fixtures have been set and traps filled with water, submit entire drainage, waste, and venting system to final test with smoke.

E. Water Test:

1. Apply water test to drainage, waste, and venting system either in its entirety or in sections.
2. If entire system is tested, tightly close openings in pipes except highest opening.
3. Fill system with water to point of overflow.
4. If system is tested in sections, each opening except highest opening of section under test shall be tightly plugged.
5. Fill each section with water and test with at least 10 foot head of water.
6. In testing successive sections, at least upper 10 feet of next preceding section shall be tested so that each joint of pipe in building except uppermost 10 feet of system has been subjected to test of at least 10 foot head of water.
7. Keep water in system or in portion under test for at least 60 minutes before inspection starts.
8. Repair any leaks discovered during test.
9. Repeat test until system holds water for six (6) hours without drop in water level.

F. Final Smoke Test:

1. Produce smoke by smoke machine.
2. Maintain pressure equal to 1 inch water column for 15 minutes before inspection starts.
3. Repair leaks discovered during test.
4. Repeat test until system holds smoke for ten (10) minutes without showing leaks.

G. Final Smoke Test: At the completion of project where new sanitary sewer piping is installed and/or existing sanitary sewer piping is modified, the entire sanitary sewer system for the facility shall be tested as indicated below. RISD construction manager shall be notified (2) days in advance of when the test shall occur. Contractor shall document testing procedures, start time and time of completion. This information shall be included into the O & M manuals as part of the final close out documents.

1. Produce smoke by smoke machine.
2. Maintain pressure equal to 1 inch water column for 15 minutes before inspection starts.
3. Repair leaks discovered during test.
4. Repeat test until system holds smoke for ten (10) minutes without showing leaks.

END OF SECTION

SECTION 22 14 00

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 01 - General Requirements and referenced documents.

B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide a complete storm drainage system as indicated herein and as indicated on the contract drawings.

B. Provide an area drainage system within and to 5 feet outside building line or as otherwise indicated on the drawings.

C. Provide a subsoil drainage system as indicated herein and as indicated on the Contract Drawings.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.

C. Product Data:

1. Pipe.
2. Fittings.
3. Joining methods.
4. Roof drains.

D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction.

E. Provide closeout documents as required in Division 1, Section 01 17 00.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing.
2. Provisions specified in this Section.
3. Local Plumbing Code.

B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Above ground:

1. Pipe 1-1/2 Inches through 10 Inches: CISPI 301, or ASTM A888, no hub cast iron pipe.
2. Fittings 1-1/2 Inches through 10 Inches: CISPI 301,or ASTM A888, no hub cast iron fittings.
3. Pipe 12 Inches and larger: ASTM A74, service weight, cast iron, single hub, coated.
4. Fittings 12 Inches and larger: ASTM A74, service weight, cast iron, hub and spigot fittings, coated.
5. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be NSF Internationally listed.

B. Below Slab or Grade:

1. Pipe, all sizes up to 10 Inches: ASTM A74, service weight, cast iron, single hub, coated inside and outside.
2. Fittings, all sizes up to 10 Inches: ASTM A74, service weight, cast iron, hub and spigot fittings, coated inside and outside.
3. Storm lines 12" through 18" shall be mechanical joint SSB - ductile iron Class 350 pressure pipe and fittings. Extend to point of connection 5'-0" outside exterior building wall and/or further, as indicated on the drawings, and connected to piping provided by Civil Contractor. All pipe shall be installed in accordance with the manufacturer's instructions and be equal to products as manufactured by Tyler Pipe.
4. Storm Lines Below Grade, 5' Beyond Building - 12" and Larger Pipe Size: Provide reinforced concrete pipe (R.C.P). RCP shall comply with current specifications, including ASTM designation C76, AASHTO M170, and Federal S-P-375, Class I, II, III and IV. RCP pipe shall be machine made as manufactured by Gifford-Hill & Company and Hydro Conduit, Inc. Joints shall be a rubber-type flexible and watertight compression gasket. The rubber gasket shall meet ASTM Designation C443 (C443M) for circular concrete sewer pipe.
5. Optional Piping 5' Beyond Building: PVC, Class 200.
6. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be NSF Internationally listed.

C. Cast Iron Soil Pipe Joints:

1. Pipes with hubs: Provide neoprene compression gasket seals, ASTM C564.
2. Hubless pipe: Provide 28 gauge stainless steel shield and clamp assembly over one piece neoprene sealing sleeve, Clamp-All “HI-TORQ 80", or equal.

D. Optional piping below slab and buried in grade as approved by Authorities having jurisdiction:

1. Piping: Polyvinyl Chloride (PVC) Schedule 40, drain waste vent (DWV) pipe; ASTM D2466, ASTM D2321, ASTM D2665 and ASTM D1785, NSF stamped and approved. System rated for 200 psi minimum pressure.
2. Fittings: PVC Schedule 40 (DWV) ASTM D2665 NFS stamped and approved.
3. Solvent Cement: Shall comply with pipe and fitting manufacturers recommendations and shall be a two (2) step process with Primer manufactured for thermoplastic piping systems and solvent cement per manufacturer and shall conform to ASTM D2564 and ASTM F656.

E. Cast Iron Storm Pipe:

1. Storm Drain Piping 12" through 18": Mechanical joint SSB-Ductile iron Class 350 fittings as manufactured by Tyler Pipe.

2.2 ROOF DRAINS

A. Acceptable manufacturers:

1. Model numbers specified are products of Jay R. Smith, unless otherwise specified.
2. Other acceptable manufacturers:
   a. Josam.
   b. Wade.
   c. Watts.

B. Roof Drain (RD):

1. Duco coated cast iron body with combined clamping ring and gravel stop; no hub outlet; drain receiver with underdeck clamp, adjustable extension collar and vandalproof cast iron dome.
2. Acceptable product: Smith No. 1015Y-CID-C-R-U.

C. Emergency Overflow Roof Drain (OD):

1. Same as standard roof drains except with adjustable internal water collar for drains with (2") two inch - (6") six inch outlet, set not more than two inches (2") above the primary roof drain flood level or Same with cast iron external 2" two inch high clamping collar for drains with (8") eight inch and (10") outlet.
2. Acceptable product: Smith No. 1074Y-CID-C-R-U (2"-6" outlet) or No. 1080Y-AE-CID-C-R-U (8"-10" outlet).

2.3 DOWNSPOUT NOZZLE

A. Smith No. 1770, cast bronze downspout nozzle, loose wall flange and threaded connection.

2.4 DOWNSPOUT BOOTS

A. Downspout boots for connection to underground storm system shall be constructed of cast iron with one coat of rust inhibited primer applied at the factory, inlet shall match sheet metal gutter downspout dimensions, 6" diameter outlet, 60" long stock length.

B. Refer to Architectural Plans for quantities and installation details.

C. Secure boot per manufacturer's recommendations.

D. Acceptable Products: McKinley #DS2.

2.5 CLEANOUTS

A. Acceptable Manufacturers:

1. Josam.
2. Jay R. Smith.
3. Wade.
4. Zurn.
5. MIFAB.

B. Size: Cleanouts shall be same size as pipe up to 4 Inches; 4 Inch for 4 Inch and larger pipe.

C. Cleanouts for Cast Iron Pipe: Tapped extra heavy cast iron ferrule, caulked into cast iron fittings.

D. Cleanout Plugs:

1. Meet requirements of Plumbing Code, with American Standard pipe threads.
2. Gasket Seal bronze plug.

E. Cleanouts do not require special covers on lines in completely accessible pipe chases or in equipment rooms where piping is exposed.

F. Pipe Fittings at Cleanouts: Make cleanouts turning out through walls and up through floor by long sweep ells or "Y" and 1/8 bends.

G. Cleanout Cover Plates:

1. Provide face or deck plates for concealed cleanouts to conform to Architectural finish in room.
2. Where no definite finish is indicated, wall plates shall be stainless steel and floor plates nickel bronze.
3. Provide vandalproof screws.

H. Acceptable Products:

1. In floor with Linoleum tile or vinyl tile finish:
    a. Round Nickel Bronze top.
    b. 1/8" tile recess
    c. Smith No. 4152L-NB-U.
2. In floor with ceramic tile finish:
    a. Square Nickel Bronze top.
    b. Scoriated top.
    c. Smith No. 4052L-NB-U.
3. In finished rooms flush with wall:
    a. Vandal Proof Stainless Steel Center screw
    b. Cleanout tee with Stainless Steel Round Cover.
    c. Smith No. 4530Y-SS-U.
4. In fan or mechanical room floors with concrete finish and/or with floating floors:
    a. Round Nickel Bronze Extra Heavy Duty top.
    b. Secured Scoriated top.
    c. Smith no. 4112L-NB-U.
5. In floors with carpet:
    a. Continuous Carpet: Round Nickel Bronze top with Nickel Bronze Carpet Clamping Device (-X).
    b. Carpet Squares: Round Nickel Bronze Scoriated top below carpet and screwed Stainless Steel Carpet Cleanout Marker. (-Y).
    c. Smith No. 4032L-Y-NB-U or 4032L-X-NB-U.
6. For terrazzo floor finish:
    a. Round Nickel Bronze top.
    b. 1/2" deep poured floor recess
    c. Smith No. 4192L-NB-U.
7. Exposed stack:
    a. Duco Coated Cast iron cleanout "tee".
    b. Gasket Sealed countersunk bronze plug
    c. Smith No. 4511S-Y-U.
8. Underfloor chase:
    a. Cast iron Cleanout body.
    b. Gasket Sealed countersunk bronze plug.
    c. Smith No. 4293L-U.
9. Vehicle Traffic Outside Grade:
    a. Duco Coated Heavy Duty Cast Iron Round Cleanout Housing.
    b. Scoriated Cast Iron Cover with Lifting Device.
    c. Vandalproof screws
    d. Cast iron cleanout ferrule and Gasket Seal Bronze Plug.
    e. Smith No. 4262L-U.
10. Grade:
    a. Duco Coated Extra Heavy Duty Cast Iron Top.

b. Installed in concrete block 18" x 18" x 6", or surround each cleanout with a minimum of four inches (4") of concrete by six inches (6") thick, top of block shall be flush with finished grade.
c. Smith No. 4232L-U.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install roof drains, reducers, increasers, flanges, and fittings between piping and drains in accordance with manufacturer's recommendations.
2. Make offsets necessary to avoid construction interferences.
3. Protect piping from damage and corrosion.
4. Connect drains receiving water to storm drain system of building.
5. Coordinate precast trench and other types of grating system installations with Drawings.
6. Horizontal pipe and fittings six inches (6") and larger shall be suitably braced to prevent horizontal movement. This shall be done at every branch opening or change of direction by the use of braces, blocks, rodding, or other suitable methods, to prevent movement. Consult pipe manufacturer's recommendations for approved methods.

B. Slope:

1. Horizontal drainage lines 2 inches and smaller: Slope minimum 1/4 inch per foot toward main sewer.
2. Horizontal drain lines 3 inches and larger: Slope minimum 1/8 inch per foot toward main sewer.
3. Run horizontal drain lines in straight lines at uniform slopes.
4. Make changes in direction of flow of horizontal lines with Y and 1/8 bends.

C. Cleanouts:

1. Install in each change of direction 90 Degrees or greater, end of lines, base of risers and other points necessary to enable cleaning out of pipe sections.
2. Cleanouts shall be readily accessible.
3. Extend cleanouts on concealed piping through and terminate flush with wall, floor, or grade.
4. Cleanouts shall be not more than 50 feet apart for 3 inch and smaller pipe, and not more than 100 feet apart for 4 inch and larger pipe.

D. Insulation:

1. Provide insulation on body and piping of roof drains and overflow drains, per Section 22 07 00.

3.2 FIELD QUALITY CONTROL

A. Furnish instruments, equipment, and labor necessary to conduct tests.

B. Methods of sampling, inspecting, and testing shall conform to local codes.

C. Test underground storm drainage piping before backfilling.

D. Test storm drainage piping with water.

E. Submit drainage system to final test with smoke.

F. Water Test:

1. Apply water test to entire system or in sections.
2. If entire system is tested, tightly plug openings in pipes except highest opening.
3. Fill system with water to point of overflow.
4. If system is tested in sections, tightly plug openings except highest opening of section under test.
5. Fill section with water to 10 foot head of water.

6. In testing successive sections, upper 10 feet of next preceding section shall be tested so that each joint of pipe in building except uppermost 10 feet of system has been subjected to test of 10 foot head of water.
7. Keep water in system or in portion under test for one hour before inspection starts.
8. System shall than be made tight at all joints.
9. Repair leaks.
10. Repeat test until system holds water for six hours without drop in water level.

G. Final Smoke Test:

1. Produce smoke by smoke machine with pressure equivalent to 1 inch water column maintained for 15 minutes before inspection starts.
2. Repair leaks.
3. Repeat test until piping system holds smoke ten minutes without showing leaks.

END OF SECTION

SECTION 22 21 13

PLUMBING PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 22 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 SYSTEM DESCRIPTION

A. Furnish and install all piping of every kind required, specified, or shown on the Drawings for the installation of the work specified in Division 22. The location, direction, and size of the various lines are indicated on the Drawings. Lines for pilot and controls and instrumentation are not shown but shall be installed as required and as specified.

B. Piping systems shall include all appurtenances shown on the drawings and specified herein.

C. Valves or cocks shall be installed to control the flow of water to each of the various systems, to segregate individual items of equipment and parts of fluid circulating or supply systems, and to permit draining of systems or portions thereof, to blow-off strainers, etc., as directed on the Drawings and specified.

D. The work shall include the furnishing and installing of all supporting structures and members for pipes, ducts, and equipment.

E. Support devices and members shall include vibration and noise isolating devices and assemblies. Penetrations of walls to structure shall be sealed off to limit noise transmission through sleeves.

F. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the best quality.

B. All equipment and materials shall be installed by experienced mechanics certified and trained for the work performed.

1.4 SUBMITTALS

A. Product Data: Submit complete manufacturer's descriptive literature and installation instructions in accordance with Section 01 33 00 for all piping materials to be used for each system, valves and plumbing specialties as specified herein.

B. Shop Drawings:

1. Submit in accordance with Sections 01 33 00 and 22 05 00.
2. Submit 1/4" = 1'-0" Plumbing Piping Shop Drawings.
3. Overlay piping Shop Drawings over other Shop Drawings of other trades to include electrical and sheet metal Shop Drawings.
4. Plan views of congested areas and sections thereof shall be drawn at a scale of 3/8" = 1'-0".

5. There is a minimum $150.00 fee, payable to the engineer to obtain Auto Cadd files for this purpose. A “Release of Liability” form must be signed after which a single CD will be produced when payment is received.

C. Fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the Contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the Engineer.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Storage and protection of materials shall be in accordance with Section 22 05 00.

C. Take special precautions to protect control valve internals from construction dirt and debris. If valves are stored on site cover valve openings until just prior to installation but in no case shall valves be unprotected for more than 48 hours.

D. Openings in piping system, boilers, pumps, valves and other heat exchangers shall be covered during the construction period to protect the interior accumulation of dirt and debris in these systems until immediately prior to connection to these components to similarly protected systems.

PART 2 - PRODUCTS

2.1 FLANGES

A. Flanges in welded lines for water systems shall be 150 pound forged steel, welding neck flanges, except where cast iron fittings are used as specified elsewhere in these specifications, and except as otherwise shown.

B. Flanges in screwed ferrous lines shall be 125 pound cast iron or 150 pound forged steel screwed flanges.

C. Where ferrous flanges connect to flat faced flanges on valves, items of equipment, etc., the companion flange shall be flush faced and where the flanges on items of equipment are raised face flanges, the companion flanges shall have raised faces.

D. Flanges in copper lines shall be solder joint type cast brass flanges.

E. Flange bolts and nuts shall conform to the applicable requirements of the latest edition of the Code for Pressure Piping.

F. Slip-on welding neck flanges are prohibited.

G. Flanges shall be Weldbend, Tube Turn, Hackney, or approved equals.

2.2 GASKETS

A. Install gaskets between flanges of all flanged joints. Where used with brass or bronze flanges or with flat face ferrous flanges, they shall be full face type. For all other flanges they shall be ring gaskets properly cut to fit within the inside edges of the bolts.

B. Gaskets in water lines shall be Garlock No. 24 Wire Insertion Red Rubber Sheet Packing, 1/16" thick and for any other systems use special materials suitable for the duty as recommended by their manufacturer.

2.3 INSULATING FITTINGS

A. Except that no dielectric fitting shall be installed in connections between copper or brass and sanitary cast iron waste, drain and vent lines, wherever an interconnection is made between ferrous pipes or vessel and copper tubing or brass pipe, or vice versa, install a dielectric fitting.

B. In lines assembled with screwed or soldered joints, use insulating couplings (unions) suitable for the intended service and where flanged connections are required, use insulating gasket material between flange faces, insulating grommets between bolts and holes in flanges and insulating washers under both bolt heads and nuts.

C. PVC couplings of any kind shall not be acceptable for insulating couplings.

D. Insulating fittings shall be suitable for the service medium, operating pressure and temperature. Fittings shall be rated for 1.5 times the normal system operating temperature and pressure in which installed.

E. Insulating fittings shall be as manufactured by EPCO, Maloney, or Crane.

2.4 VALVES

A. All valves of any one type shall be of the same make throughout and insofar as practicable all valves in a given category shall be of the same make.

B. All valves shall be so located as to be readily accessible for operation and maintenance.

C. Furnish and install all valves indicated on the Drawings, specified herein, and required to control the flow of water to and from various parts of the systems and to isolate various pieces of machinery and equipment and to isolate various parts of the systems.

D. Each valve for installation in a line to be insulated shall have sufficient clearance between the valve body and the operating handle or device to accommodate the insulation.

E. All valves shall be designed for re-packing under pressure when fully opened and shall be equipped with packing suitable for the service.

F. Valves shall generally be installed with stems up; but, in no case, less than horizontal and whenever possible shall be grouped together in a uniform manner.

G. Except where special valves are specified elsewhere herein or as required by special conditions or class of work, valves shall be equivalent to the following Nibco Co.valve numbers listed herein.

H. All valves used for domestic water service shall be Lead-Free per the “Safe Drinking Water Act”. U.S. Senate Bill S. 3874.

I. All Lead Free gate valves 3" and larger shall be Class 125SWP and 200 PSI CWP rated for 200 degrees and below.

1. Valves shall have rising stem, screwed bonnet or union bonnet, solid wedge manufactured in accordance with MSS-SP-80, and shall be epoxy coated on the interior and exterior for use with potable water system.
2. Body, bonnet and wedge shall be manufactured of ASTM B-62 alloy.
3. All valves shall have ductile or malleable iron handwheels.
4. Stems shall be made of dezincification resistant silicon bronze ASTM B-371 or low zinc alloy B-99.
5. All valves shall be supplied with non-asbestos packing, amarid fibers or approved equal.
6. Where higher operating pressures approach 150 psi, Class 150 Union bonnet valves of similar construction shall be used.
7. All valves 3" and larger shall be Class 125SWP and 200WOG rated for 200 degrees F., be of the flanged design, have bronze trim, and have an outside screw and yoke design.

8. Class 125 valves 3" and larger shall be one of the following:
    a. Nibco - F-617-0.
    b. Apollo - 611F
    c. Jenkins - 454J.
    d. Hammond IR1140.
9. Class 150 valves shall be one of the following:
    a. Nibco - T/S134.
    b. Apollo – 621F
    c. Jenkins - 47CUJ.
    d. Hammond IB629/IB648.

J. All Lead Free globe valves 2" and smaller shall be Class 150 rated to 200 degrees F. or Class 300 rated for 300 degree F and below.

1. Valves shall have rising stem, screwed or union bonnet and manufactured in accordance with MSS-SP-80.
2. Body and bonnet shall be manufactured of ASTM B-62 alloy or ASTM B-61 alloy.
3. All valves shall have ductile or malleable iron handwheels.
4. Stems shall be made of dezincification resistant silicon bronze ASTM B-371 or be low zinc alloy B-99.
5. All valves shall be supplied with non-asbestos packing, amarid fibers or approved equal.
6. Where higher operating pressures approach 300 PSI, Class 300 Union bonnet valves of similar construction shall be used.
7. All valves 2-1/2" and larger shall be Class 125WP and 200WOG rated for 200 degrees F., be the flanged design, have bronze trim, and have an outside screw and yoke design.
8. Class 150 valves shall be one of the following:
    a. Nibco - T-235-Y.
    b. Apollo – 122T.
    c. Jenkins - 106BJ.
    d. Hammond IB413-T.
9. Class 125 valves shall be one of the following:
    a. Nibco - F-718-B.
    b. Apollo – 711F
    c. Jenkins - 2342J.
    d. Hammond IR116.
10. Class 300 valves shall be one of the following:
    a. Nibco - T-276-AP.
    b. Apollo – 128T
    c. Jenkins - 592J.
    d. Hammond IB444.

K. Where cocks are required, they shall generally be brass, screwed pattern up to 2" and cast iron flanged pattern 2-1/2" and larger plug cocks suitable for the system pressure. Also provide and install all special cocks required such as pet cocks, gauge cocks, etc.

L. Provide Lead Free plug valves where indicated, at "all water balance stations" and at all pump discharges.

1. In no case shall butterfly or ball valves be substituted for plug valves where plug valves are indicated on the Drawings.
2. Valves shall be flanged-type, 2-1/2" and larger, and threaded 2" and smaller.

3. Plug valves 4" and smaller shall be equal to DeZurik Series 400 eccentric plug valves with cast iron bodies.
4. Plug valves over 4" in size shall be equal to DeZurik Series 100 eccentric plug valves with cast iron bodies.
5. Valves 4" or smaller shall have cast iron bodies with bronze plugs on sizes 2" and smaller and electroless nickel plated cast iron plugs on 2-1/2" to 4" valves.
6. Valves over 4" shall have cast iron bodies with stainless steel plugs and bearings.
7. All plugs shall have resilient faces rated for water temperatures up to 250 Deg.F. and stem seals meeting the same temperature rating. For general chilled and heating water applications, elastomeric coating shall be EPDM.
8. Furnish lever operator for all valves except at water coils of terminal units where snap-on plastic caps shall be furnished.
9. All valves shall have adjustable memory stops with plastic drip caps.
10. Plug valves shall be furnished with drilled and tapped 1/8" openings for pressure gauge connections at both upstream and downstream sides.
11. Plug valves shall be bubble tight with 150 pound differential pressure across the seat.
12. An indicator shall be included to show valve position.
13. All flanged plug valves shall have bolted bonnets.
14. All valve seats shall be welded in nickel for plug valves over 4" in size.
15. Plug valves shall be as manufactured by:

    a. SMG.
    b. McDonald.
    c. Rockwell-Nordstrom.
    d. Milliken.

M. Lead Free Check valves in pump discharge lines shall be flanged non-slam type silent check valves. Valves shall have a bronze body and be bronze fitted with stainless steel springs. Valves shall be rated for 125 PSIG WOG and be one of the following products:

1. Nibco - 480 Series, or equal by
2. Apollo 61LF-100.
3. Hammond UP943 or UP947.

N. Lead Free Swing Check Valves 2" and smaller shall be the Y-pattern swing-type manufactured in accordance with MSS-SP 80, and be Class 125 rated to 200 degrees F or below, have bronze ASTM B-62 bodies with bronze discs. Swing check valves 2" and smaller shall be of the following:

1. Nibco - T/S-413-B.
2. Apollo 161 T/S-LF.
3. Milwaukee UP509 or UP1509.
4. Hammond - UP904 or UP912.

O. Lead Free Swing Check valves 2-1/2" and larger shall be the swing-type manufactured in accordance with MSS-SP71, be Class 150 rated for 200 degrees F. or below, be flanged, have ASTM A126, Class B, cast iron bodies with bronze trim, and have non-asbestos gaskets. Swing Check valves 2-1/2" and larger shall be one of the following:

1. Nibco - S-433-B, or equal by
2. Apollo.
3. Milwaukee.
4. Hammond.

P. Bronze Lead-Free Ball valves: 2” and Smaller:

1. Ball valves shall be on the following products:

    a. Nibco T-585-66-LF or S-585-66-LF.
    b. Apollo 77CLF-140 Series.
    c. Hammond UP8301A or 8311A.

2. Ball valves may also be used in lieu of plug valves for balancing purposes for lines 2" and smaller and only when provided with memory stops.
3. Ball valves shall be full port design with stainless steel ball and stem.
4. All ball valves shall be manufactured from a dezincification resistant material with less than 15% zinc.
5. Provide memory stops where used for balancing or as shown and where detailed.
6. Provide extended lever handles for all valves installed in insulated lines.
7. Ball valves installed on water piping shall be provided with an extended "T" handle with insulation insert and collar that creates a vapor seal to prevent condensation while allowing adjustment of memory stops and valve packing maintenance without disturbing the insulation. Insulated "T" handles shall be equal to Nib-Seal as manufactured by NIBCO. No extended metal handles are allowed.

Q. Flanged FDA Approved Lead-Free Ball valves: 2½" and Larger:

1. Ball valves shall be on the following products:
   a. Watts G4000M1.
   b. Apollo 70LF-140 Series (2 ½"-4").
   c. Apollo 6PLF
2. Ball valves shall be full port design with stainless steel ball and stem.
3. Ball valves shall be manufactured with FDA approved epoxy coating.

R. Lead Free Manual Balancing Valves

1. Valves shall be cast bronze body with stainless steel ball construction with glass and carbon filled TFE seat rings tapped purge port, memory stops, calibrated name plate, with positive shut-off, provide Bell & Gossett "Circuit Setter Plus" or equal by ARMSTRONG, NIBCO & DANFOSS shall have differential pressure read-out ports across the valve seat. Read-out ports shall be fitted with internal EPT check valves.

S. Lead Free Automatic Balancing Valves

1. ThermOmegaTech – "Circuit Solver Assembly" CSUA or CSUA-PP with integral spring check valve. Stainless steel self-contained fully automatic thermal flow control device. Assembly shall be provided with lead-free full port bronze ball valves, integrated union and internal spring check valve.

T. All valves, valve packing material, gaskets, pipe threading compound, etc., shall be compatible with ethylene glycol, without exception. Typically, use EPDM valve packing materials. No teflon materials are allowed. Indicate compliance on submittals.

2.5 PIPE HANGERS

A. Pipe hangers, except for fire protection types, shall be as manufactured by Anvil International, Inc. and be of a type suitable for each use. Approved equals by Mason Industries, Inc., B-Line, Grinnell, and PHD Manufacturing, Inc. will be considered.

B. For cast-iron pipes up to three inches (3") in size, use Anvil Fig. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil Fig. 590 steel clevis hanger. For cast iron plumbing piping four inches (4") and larger, use only Anvil Fig. 590 steel clevis hanger.

C. For PVC, CPVC, PVDF, Polyproplene pipe sizes up to three inches (3") ini size, use Anvil FIG. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil FIG. 590 Steel Clevis hanger. For sizes four inches (4") and larger, use only Anvil FIG. 590 Steel Clevis hanger.

D. Domestic cold and hot water piping 3/4" in size up to and including twelve inches (12"), shall be Anvil Fig. 260, adjustable clevis hangers. Hangers shall be sized to be on the outside of the insulation.

E. Where several pipes are routed parallel to each other and at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for elsewhere by these specifications.

F. For bare copper pipes (uninsulated only) up to and including three inches (3") in size, use Anvil Fig. CT-109 malleable iron, copper plated, split ring, hangers or Anvil Fig. CT-65 copper plated clevis hangers. For uninsulated copper pipes larger than three inches (3"), use Anvil Fig. CT-65 copper-plated clevis hanger.

G. Hanger rod sizes shall conform to the following schedule:

Pipe up to, and including 2"	3/8" rods
Pipe 2-1/2", 3", and 3-1/2"	1/2" rods
Pipe 4" and 5"	5/8" rods
Pipe 6"	3/4" rods
Pipe 8", 10" and 12"	7/8" rods
Pipe 14", 16" and 18"	1" rods
Pipe 20" up to 30"	1-1/2" rods

H. Unless shown otherwise on the Drawings, all horizontal runs of steel piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and 3"	12 feet
Pipe 3-1/2" and 4"	12 feet
Pipe 5" and 6"	*8 feet
Pipe 8" and larger	*8 feet
* Maximum 8 foot spacing for pipe supports for pipes 5" and larger due to structural considerations.	

I. Unless shown otherwise on the Drawings, all horizontal runs of cast-iron piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	5 feet
Pipe 1-1/2" and 2"	*5 feet
Pipe 2-1/2" and 3"	*5 feet
Pipe 3-1/2" and 4"	*5 feet
Pipe 5" and 6"	*5 feet
Pipe 8" and larger	*5 feet
* Maximum horizontal spacing of cast-iron pipe hangers shall be increased to 10 feet where 10-foot lengths of pipe are installed.	

J. Unless shown otherwise on the Drawings, all horizontal runs of “Poly” thermoplastic type piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	4 feet
Pipe 1-1/2" and 2"	4 feet
Pipe 2-1/2" and 3"	4 feet
Pipe 3-1/2" and 4"	4 feet
Pipe 5" and 6"	4 feet
Pipe 8" and larger	4 feet

K. Unless shown otherwise on the Drawings, all horizontal runs of copper piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size	6 feet
Pipe 1" and 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and larger	12 feet

L. There shall be a hanger within two feet (2') for any ferrous or copper piping and eighteen inches (18") for any “poly” thermoplastic type pipe of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps. Vertical pipes within a space shall have not less than two (2) supports. Where the vertical run of pipe in a space exceeds 14 feet then three (3) supports shall be required.

M. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.

N. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Anvil Fig. 281, wedge type, concrete inserts. All inserts shall be pre-treated to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.

O. Expansion bolts shall be Ackerman-Johnson.

P. Beam clamps suitable for the use with the type of steel construction involved shall be an Anvil product or an approved equal as indicated elsewhere herein.

Q. No perforated straps shall be used to support any mechanical equipment item or piping of any kind.

R. Potable and non-potable domestic cold water, domestic hot water (includes recirculated lines), horizontal and vertical storm drain downspouts and soil piping receiving cold condensate piping hangers shall be sized to go around the insulation with shields being provided to protect the insulation. Shields shall be Anvil Fig. 167.

S. All steel hangers, base plates, supports, nuts, bolts, and all thread rod located outdoors, in crawl spaces, and exposed to the weather, shall be made of galvanized steel or equally suitable corrosion resistant steel alloy or aluminum. Where steel components are allowed and used under these conditions they shall be painted with an equivalent protective coating similar to a two-part epoxy. Refer to Section 09 90 00.

T. For pipe sizes 8" and under use Anvil Fig. #93 and 94 beam clamps. For pipe sizes 10" through 18" use Anvil Fig. #66 in the “U” position.

2.6 SLEEVES AND ESCUTCHEONS

A. Generally where pipes pass through interior building walls or floors above the first floor (out of the ground), 22 gauge galvanized sheet metal sleeves shall be used. Sleeves shall extend a minimum one inch (1") above a floor or beyond the wall, as applicable.

B. All pipes penetrating grade beams, exterior walls, concrete structural members, or concrete slabs of mechanical equipment rooms on the first floor shall generally use standard weight galvanized steel pipe as the sleeving material.

C. For concrete or masonry walls, sleeves shall be inserted into the masonry, decking or form work prior to the pouring or placement of concrete or masonry units to create a leave out.

D. The sizes of all sleeves shall be such as to permit the subsequent insertion of the intended pipe of the proper size with adequate clearance for movement due to expansion and contraction. In the case of insulated lines, the diameter of the sleeves shall be at least 1/2" greater than the outside walls of the pipe with specified thickness of insulation. This will require that the inside diameter of galvanized steel pipe sleeves be at least 1/2" greater than the outside diameter of the service pipe with insulation. Galvanized steel pipe sleeves set in floors shall project two inches (2") above the floor.

E. After the pipes are installed, fill the annular space between the pipe, and insulation as required, and its sleeve with an approved mastic or caulk. Use loose fibrous insulation packing as required to accomplish this. In all cases the annular spaces around the pipes within the sleeved openings shall be filled with loose fibrous insulation and then sealed with an approved caulking or expanded foam insulation.

F. Escutcheons, except as specifically noted or specified, shall be installed on all pipes passing exposed through floors, walls, or ceilings. Escutcheons shall be equal to the Crane No. 10, chrome plated sectional floor and ceiling plates, and shall fit snugly and neatly around pipe or pipe insulation or insulated lines. Solid chrome plates with set screws shall be used if sectional plates do not fit properly or stay in place. Where multiple pipes penetrate floors or walls in close proximity in concealed areas, shop made sheet metal escutcheons may be used.

G. Pipes sleeved through grade beams open to basements, crawl spaces or void spaces below grade shall additionally receive "Link Seal" or equal closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.

H. Where PVC pipes, 3 inches and smaller, and small copper water piping under 2 inches in size, penetrated a horizontal floor slab a metal sleeve will not be required. For these piping systems, completely wrap the piping with a polyethylene tape, or wrapping. This tape shall be minimum 4 mils thick and shall be wrapped at least two times around the pipe and secured sufficiently to hold the wrap in place during the pouring of the slab. This wrap shall be in sufficient length or height to insure that no concrete will be in contact with the pipe. All other piping shall be sleeved as indicated elsewhere herein.

I. Refer to Section 22 05 00 for additional requirements of penetrations through fire-rated assemblies.

2.7 ACCESS DOORS

A. Wherever access is required above inaccessible ceilings, in walls, furrings, chases or soffits to physically reach concealed piping, or equipment installed under Division 22, provide access doors of sufficient size to maintain, repair, replace or suitably access devices intended to be adjusted as indicated herein.

B. Provide an access door or panel for each of any valves, group of valves, damper pull rods, splitter dampers, manual volume dampers, actuators or other controlling mechanism installed under Division 22 which would otherwise be concealed in the building construction with no access.

C. All access doors in toilet rooms, locker rooms, showers, kitchens, or other similar wet areas shall be the flush mounted type and be made of brush or satin finish stainless steel as manufactured by Milcor or ELMDOR.

D. All access doors shall be minimum 18" x 18", unless noted otherwise, in size unless otherwise approved in writing in advance by the Engineer. Doors shall be increased in size as required to allow for a person to reasonably access, adjust, maintain, service, inspect or replace the largest single component concealed. Provide special sizes of access doors as required.

E. Coordinate the final location of all concealed equipment and devices requiring access with the final location of the required access panels or doors. Allow ample space for the removal of all parts and equipment that require replacement or servicing.

F. Where mounting heights are not detailed or dimensioned, install mechanical piping and overhead equipment to provide the maximum headroom possible while maintaining reasonable access and service to those items being accessed.

G. All serviceable equipment shall be within immediate reach (maximum of 12") from the access door.

H. Install all access doors in locations to suit the intended purpose but have each location reviewed and approved by the Architect. In no case shall access doors be located such that the intended purpose is rendered useless.

I. Access doors shall all have spring concealed hinges, screwdriver operated cam latches, be the flush mounted type, open up to, but not more than, 175 degrees, be made of steel, or stainless steel to suit the application, be fire rated (U.L. rated) to match the rating of the surface where the door is placed, and have a powder coated electrostatic primer paint on all steel doors. Furnish the following access door types as described below:

1. Milcor Style DW - Flush drywall type with frame made of 16 gauge steel, panel door made of 14 gauge steel, galvanized steel drywall bead on frame, and removable hinge pins for removal of panel door. Provide minimum of two hinges (12" x 12" and larger) up to 24" x 24" in size and three hinges on access doors above this size. Provide one cam for access doors 14" x 14" and smaller and a minimum of three cams on larger sizes.
2. Milcor Style K - Flush plaster wall or ceiling type made similar to Style DW except with a 22 gauge expansion casing bead, one hinge on 12" x 12" access doors, two hinges on larger doors with either side no larger than 24", three hinges on doors with any dimension of 24" or larger, minimum one cam on doors with no dimension larger than 18" and two or more cams on larger access doors.
3. Milcor Style M or MS - Flush drywall, masonry or tile type made similar to Style DW except with 14 gauge steel frame and doors (16 gauge when made of stainless steel-satin finish), one hinge on access doors up to 18" x 18" in size, two hinges on sizes 20" x 24" and 22" x 22", three or more hinges on sizes 24" x 24" and larger, and the number of cams as standard with the manufacturer.
4. Provide other types of access doors suitable for the application to include surface mount, double leaf for access doors exceeding 36" in any dimension, louvered where indicated on the Drawings, fire rated, recessed or security/detention types as required and compatible with the surface penetrated.
5. Acceptable manufacturers: ELMDOR or Milcor.

2.8 STRAINERS

A. Strainers shall be of the FDA approved, heat fused epoxy coated (interior and exterior) "Y" pattern type bodies, unless shown or specified otherwise. Body ends shall be screwed or flanged to match the type of joints in the piping in which the strainers are installed. Strainers shall have a 200 psi non-shock, ANSI B16.1 pressure rating. Watts 77F-DI-FDA-125, or Engineer approved equal.

B. Each strainer, screen, or mesh shall be of Type 304 Stainless steel, brass, or monel construction. Screen or mesh sizes shall be as scheduled below:

Pipe Size	Screen/Mesh Size
1/2" - 2"	20 Mesh
2-1/2" - 3"	0.045 Perforations
4" - 12"	0.125 Perforations

C. Where vertical space does not permit the installation of the "Y" strainer, install an equivalent basket strainer.

D. Strainers shall be of the FDA approved, heat fused epoxy coated (interior and exterior) “Y” pattern type bodies, unless shown or specified otherwise. Body ends shall be screwed or flanged to match the type joints in the piping in which the strainers are installed. Strainers shall have a 200 psi non-shock. ANSI B16.1 pressure rating. Watts 77F-DI-FDA-125, or Engineer approved equal.

E. Lead Free Bronze Strainers for screwed piping shall be Watts LF777 Series (cast bronze body) with bronze plug stainless steel mesh strainer for copper piping; piping shall be Watts CI-125 or F-125 and CI-250 or F-250 (cast iron bodies). Equivalent as manufactured by the following will be considered:

1. Nibco.
2. Hammond.
3. Apollo.
4. Milwaukee.

2.9 GAUGES AND GAUGE COCKS OR NEEDLE VALVES

A. Provide the following pressure gauge cock or needle valve connections:

1. At the suction and discharge of each pump.
2. At the domestic water riser, downstream of main isolation value.
3. Downstream of the building main backflow preventor.
4. At the inlet and outlet of pressure reducing stations.
5. At circuit setter balance stations and any other points indicated or detailed on diagrams on the Drawings.
6. At the inlet and outlet of circulation pumps.

B. Where gauge connections are installed in insulated lines, install gauge cocks or needle valves on a nipple of sufficient length that the gauge cock or needle valve handle will be free of the pipe insulation. Position each gauge cock in relation to surrounding piping and equipment so that the gauge may be easily read and so that a gauge having a 4" diameter dial can be screwed into and out of the piping nipple where the gauge cock or needle valve is installed. All gauge cocks shall be of the tee-handle type. Needle valves shall be a Weksler AV32, AV34, or BBV4.

C. Install gauge cocks or needle valves at pumps at the pump suction and discharge flange connections at the pre-drilled and tapped gauge connections as provided by pump manufacturer.

D. Furnish and install a pressure gauge suitably calibrated at each of the following locations:

1. At the suction and discharge of each pump.
2. At the domestic water riser, downstream of main isolation value.
3. Downstream of the building main backflow preventor.
4. At the inlet and outlet of pressure reducing stations.
5. At circuit setter balance stations and any other points indicated or detailed on diagrams on the Drawings.
6. At the inlet and outlet of circulation pumps.

E. Gauges shall be of the bourdon tube type, glycerin filled, and shall be selected to operate at about the midpoint of their full range, i.e., for a 50 PSI operation, select a gauge of 0 to 100 psi. Each gauge shall be provided with a brass lever handle union cock or brass handle needle valve. Cases shall be Stainless Steel, not less than four inches (4") in diameter.

F. Pressure gauges shall be equal to Weksler Model 401L-4-PD with type ASD case, phosphor bronze with phosphor bronze brushed rotary movement and link; 4" dial, nickel plated ring, free standing stainless steel case; equipped with micrometer adjustment pointer. Provide each gauge with scale range suitable for the duty.

G. Provide pulsation dampeners, adjustable snubbers, or piston type pressure snubbers in line with all pump gauges.

H. Cocks and gauges shall be manufactured by:

1. Crosby.
2. Weksler.
3. Marsh.
4. Trerice.
5. Miljoco.
6. Weiss.

2.10 THERMOMETERS AND THERMOMETER WELLS

A. Furnish and install brass or stainless steel closed separable thermometer wells for all thermometer and controller bulbs which are designed for liquid measurements. Whenever a thermometer or controller bulb is inserted in a pipe for either remote or local temperature indication or control, locate the thermometer well so that it will be completely surrounded by flowing fluid. Such thermometer locations as are shown on the Drawings are diagrammatic only. Install thermometer wells for maximum effectiveness and in the case of locally indicating instruments, for easy readability.

B. Supply each brass test well for use with the stem thermometers, a threaded brass plug and keeper chain. Install these test wells in the following locations such that they can be filled with oil to facilitate temperature measurements:

1. At the inlet and outlet of each water coil.
2. At the inlet and outlet of each heat exchanger, evaporator and condenser.
3. At the discharge of each modulating 3-way control valve.
4. At other locations as specified herein or shown on the Drawings.

C. Where thermometer wells are called for, furnish and install brass wells with the tip of the well extending into the water stream. The well shall have a plug attached to it with a short length of chain. The wells shall be installed in the vertical or at 45 degree angle up.

D. Thermometers shall be of the industrial type with red spirit filled liquid (no mercury allowed), bronze enameled aluminum cases, glass fronts, 9" scales, separable sockets; straight or angle pattern so selected that they can be read from the floor. Straight type equal to Weksler Type 105 and angle type equal to Weksler Type 115, Type 125, or Type 135, depending upon the angle and aspect. Furnish thermometers with 2-1/2" stem extensions where they are installed in insulated lines. Select scale ranges for maximum readability at the design temperature of the medium being measured.

E. Thermometers shall be installed in the following locations:

1. At the discharge of each pump or Blending Station valve.
2. At the inlet and outlet of each heat exchanger, evaporator and condenser.
3. At other locations as specified herein or shown on the Drawings.

F. In lieu of the industrial stem type thermometers 5" dial silicon filled bi-metal thermometers with vari-angle feature or “solar only” self-powered digital thermometers (no batteries allowed) with sealed sensor technology, minimum 1/ 2" tall LCD digit size display, 1% accuracy, and variable angle stem assembly shall be allowed.

G. Thermometers and thermometer wells shall be as manufactured by:

1. Weksler.
2. Trerice.
3. Marsh.
4. Taylor.
5. Miljoco.
6. Weiss.

2.11 TEMPERATURE AND PRESSURE TEST PORTS

A. Temperature and Pressure Test Ports, or Pete’s plugs, shall be dual valve type with valve pocket between valves, retaining cap with gasket and cap "saver" connector.

B. These ports may be used at water coil connections in lieu of gauge cocks or needle valves and thermometer test wells.

C. Pete’s plugs shall have the pipe nipple extended to beyond the insulation thickness to make the plug fully accessible and a minimum of one inch (1") above the pipe insulation.

D. Ports shall be as manufactured by:

1. Pete.
2. Autoflow.
3. Flowset.

2.12 RELIEF VALVES

A. All closed water systems shall be protected with a relief valve. Valves shall be spring operated, all brass, and shall meet A.S.M.E. requirements for discharge capacities. Discharge lines shall be piped to the nearest floor drain.

B. Relief valves shall be as manufactured by Watts, Klipfel, McAlear, or McDonnell and Miller.

C. Provide atmospheric relief piping routed to the outdoors as required by local code for all steam and natural gas systems.

2.13 AIR VENTS

A. Provide and install air vents, air eliminators, where shown and at any high points or traps in water circulating lines where air might collect.

B. Each such air vent shall be installed with a valve at its inlet and shall discharge through an integral check valve. The waste lines from the discharge from air vents shall be collected and piped to the nearest floor drain in each case.

C. All automatic air vents shall have cast or ductile iron bodies with corrosion resistant bolts, Buna-N or EPDM seating materials to meet system pressure and temperature requirements, and all stainless steel internal control components.

D. Provide manual air vent cocks, or needle valve, for all water coils where not integral or supplied with coil by manufacturer.

E. Automatic air vents shall be rated for a maximum working pressure of 150 psig and 250 Deg.F.

F. Automatic air vents shall be as manufactured by:

1. Hoffman No. 792.
2. Armstrong No. AAE-750.
3. Bell & Gossett No. 107A.
4. Or equivalent by Amtrol.

2.14 VACUUM RELIEF VALVE

A. All bottom feed domestic water heating equipment shall be protected by a vacuum relief installed on the cold water inlet pipe. Valve shall be compliant with ANSI Z21.22.

B. Acceptable Product: Watts N36-M1 or Apollo VR12.

PART 3 - EXECUTION

3.1 PIPING - GENERAL

A. Where special classes of piping are involved and are not listed, the Contractor shall request instructions from the Owner's Representative as to the class of material involved and the method of fabricating it before ordering any material. All steel lines 2-1/2" and larger shall be assembled by welding. All steel lines 2" and smaller may be assembled either by welding or by screwed fittings as specified.

B. Welding shall be done by mechanics who satisfy qualification requirements of the American Welding Society. The pipe ends to be welded shall be machine beveled wherever possible. Gas cuts shall be true and free from all burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe. Fully ream, to the full inside pipe diameter dimensions, the inside of all piping to be welded. Miter joints will not be allowed in any case. All headers, connections, elbows, reducers, flanges, and special flanges and special fittings shall be made using forged steel welding fittings of the same weight as the pipe to which they are attached. All unions and connections to valves 2-1/2" and larger shall be made by the use of welded flanges.

C. Branches in lines where the branch side is equal to 2/3 of the size of the main or smaller may be connected by using Weldolets or Threadolets; where the sizes are greater than 2/3 of the main, standard weight seamless tees as manufactured by Tube-Turns or Grinnell, A.S.T.M. Standard A-234 shall be used.

D. The location, direction, and size of all lines are generally indicated on the drawings. Branch connections in general are indicated and shall be so installed as to provide proper grades.

E. All lines shall be made up straight and true at proper grades. All water filled and condensate drain lines shall grade down to drains.

F. Piping shall follow as closely as possible the routes shown on the plans and take into consideration conditions to be met at the site. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after proper approval has been obtained.

G. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which the lines are connected.

H. All headers shall be assembled as indicated using welding fittings throughout.

I. All screw joints shall be made with taper threads, properly cut. Joints shall be made tight with graphite and oil applied to the pipe threads only and not to the fittings.

J. Dielectric couplings shall be installed where ferrous pipe joins copper lines and shall be rated for the intended medium pressure and temperature or service.

K. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of systems. No unions will be required in welded lines or lines assembled with solder joint fittings except at equipment items or coils, machinery items and other special pieces of apparatus. Unions in 2" and smaller lines shall be ground joint and unions 2-1/2" and larger shall be flanged unions. Unions shall be the same material and strength as other fittings in the lines. Companion flanges on lines at various items of equipment, machines, and pieces of apparatus shall serve as unions to permit removal of the particular item.

L. All piping shall be supported by hangers independently of equipment connections. The weight of the piping and it's contents shall not be imposed on the equipment in any way.

M. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

N. Swing joints or expansion loops shall be provided wherever shown on the Drawings or wherever else necessary to allow for the expansion and contraction of piping. This shall be accomplished in an approved manner and this Contractor shall be responsible for any damage which may occur as a result of expansion and contraction of his piping.

O. Nipples shall be of the same size and material as the piping in the system in which the nipples are installed, except that "close", or "all thread" nipples shall not be used.

P. Keep all open ends of piping in each system plugged or capped to prevent dirt or other debris from entering the pipe at any and all times during construction and before fixtures or equipment is connected. All piping shall be flushed clear prior to connection to the central building systems.

Q. The ends of all piping furnished and installed in all systems shall be thoroughly reamed to the full inside diameter of the respective pipe.

R. Exposed and concealed lines shall be run parallel with, and perpendicular to building lines and wherever possible shall be grouped together for easy service and identification. Whenever possible, horizontal and vertical runs shall be held as close as possible to the walls, ceilings, struts, members, etc., so as to occupy the minimum space consistent with the proper installation requirements for insulation, conduit, ductwork, lighting fixtures, etc., and the expansion requirements of each of these items and the building proper or the removal of the respective or adjacent pipes, conduits, and ductwork, and to allow for necessary access to valves, other pipes, conduits, dampers, etc.

S. Valves required for control or isolation of any part of the various systems shall be provided and shall be located in approved or accessible positions or made accessible through removable panels, etc., and where several valves are related as to function, they shall be grouped in a battery. Request approval from Owner's Representative for proper location of all access panels required for valves, etc.

T. All automatic control valves shall be installed such that the valve stem is pointed upwards, vertical, and in no case shall it be mounted at less than a 45 degree angle from the vertical position unless specifically approved by the Engineer prior to installation.

U. All shut-off and isolation valves shall generally be installed with valve stems pointed vertically upwards. In no case shall valve stems be pointed downwards or less than in a horizontal position.

V. Where new lines are indicated to connect into existing lines, careful coordination shall be exercised to determine exact elevations and locations of existing lines, to establish grades of interconnecting new lines, to establish procedures to interconnect lines, and to establish other details.

3.2 CROSS CONNECTION AND INTERCONNECTIONS

A. No plumbing fixtures, device, or piping shall be installed which will provide a cross connection or interconnection between a distributing water supply for drinking or domestic purposes and a polluted supply such as drainage system, or a soil or waste pipe which will permit or make possible the backflow of sewage, polluted water, or waste into the water supply system.

3.3 EXCAVATION AND BACKFILLING

A. Provide necessary excavating and backfilling for the installation of work specified in this Division as specified in Section 22 05 00 and 31 23 00. Shall comply with ASTM 2321.

3.4 FLASHINGS

A. Flash around all pipes passing through the roof with sheet lead, as specified in Section 07525, built a minimum of 10" into the roofing, in all directions from the outside of the pipe running up the pipe a minimum of 10" and more where vent terminals must be higher to conform to the requirements of the local Plumbing Code in effect, and then turned over one inch (1") into the pipe cavity. All seams and joints shall be completely soldered closed and the entire flashing shall be completely waterproof.

B. Make all roof penetrations in accordance with the roofing system manufacturers approved methods and as specified in Section 07 52 50.

3.5 PIPE INSULATION INSERTS AND SHIELDS

A. Provide a section of Foamglas insulation, calcium silicate, or urethane of thickness specified at hanger support locations and provide No. 16 gauge galvanized steel protection shield minimum 12" long. Shield shall be full half cylinders equal to Grinnell Fig. 167.

B. Refer to Section 22 07 00, Insulation.

3.6 SAFETY GUARDS

A. Furnish and install all safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction.

B. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

3.7 TESTING AND REPAIRING

A. During the progress of each portion of the work or upon its completion, make such tests of this work as herein specified, or as required by the Architect, or by State or Municipal Bureaus having jurisdiction and under their supervision.

B. Provide all apparatus, temporary piping connections, or any other requirements necessary for such tests. Take all due precautions to prevent damage to the building and its contents incurred by such tests as will be required to repair and make good, at no cost to the Owner, any damage so caused. Testing of piping to be insulated shall be done before insulation is applied.

C. Perform any other tests as may be required by the Owner's Representative to indicate the fulfillment of specification requirements.

D. Pressure piping systems shall be tested with either water or air to a pressure of 150 psig or to 1-1/2 times the operating pressure, whichever is the greatest, for six (6) hours.

E. Domestic hot and cold water piping shall be tested at 1.5 times the operating pressure or 150 PSIG, whichever is greater, for six (6) hours. Any leaks developed shall be made tight and the test repeated. Test pressure shall not be applied to specialties, but joint shall be tested for leaks at operating pressure when complete.

F. Waste and vent piping shall be tested at completion of the rough work and before fixtures and traps are connected. Openings, except tops of bends, are to be plugged and the system completely filled with water. System shall stand without leak or loss of water for a period of not less than four (4) hours.

G. Systems shall be tested in portions as required by the construction schedule and the portions being tested shall be effectively isolated and sealed off. When previously tested sections are connected into other sections, tests shall be rerun to include the new connections.

H. Partial systems shall be tested prior to connecting into existing lines.

I. Leaks in screwed joints shall be repaired by tightening the joint until the leak has stopped, or by remaking the joint if tightening fails to stop the leak. Leaks in welded joints shall be repaired by chipping out the weld around the leak and rewelding until it is stopped. Leaks in caulked joints shall be completely stopped by additional caulking of the joint, but, if that fails, the joint shall be re-made. A leak in a compression joint shall be repaired by remaking the joint using a new seal, compression ring, coupling, etc., as required. Leaks in soldered joints shall be repaired by remaking the joint and no soldering or brazing over existing joints will be permitted. Any defective piping shall be replaced.

J. Additional testing shall be as specified in the individual Sections of these Specifications.

K. During testing and cleaning of piping systems, use a fine mesh, 20 mesh or smaller, start-up strainer screen for all strainer pipe sizes. After piping system is cleaned each strainer shall be taken apart, cleaned, and final strainer mesh shall be placed back in strainer for normal operating conditions.

3.8 SEALING PENETRATIONS

A. Seal all pipe penetrations through walls run to structure, ceilings, floors and roofs. Fill the annular space between the insulation on the pipe, or the pipe only where uninsulated, and its sleeve, with neoprene or non-hardening sealant.

B. No pipe or duct shall be allowed to contact its surrounding sleeve or the wall, floor, or ceiling. Effective isolation shall be provided as described in Section 23 05 48 to the end that no vibration or direct noise transmission shall be transmitted. Vibration transmission limits shall be as established in Section 23 05 48. Use special materials as may be required to comply.

C. Firestop pipe and duct floor and wall penetrations as specified in Section 07 84 00 and 22 05 00.

3.9 PAINTING

A. All equipment specified in Division 22 shall be delivered to the site with suitable factory finishes as specified elsewhere herein.

B. Items with factory applied finishes shall be protected during installation and other construction work. Damaged factory applied finishes shall be refinished to match the original finish appearance.

C. Field painting of items specified and installed in Division 22 shall be as specified in Section 09 90 00.

D. All ferrous metals that are not galvanized or made of a corrosion resistant alloy shall be painted. This shall include steel pipe hangars, trapeze supports, pipe stands, all thread hangar rods and other miscellaneous systems.

END OF SECTION

SECTION 22 42 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 01 - General Requirements and referenced documents.

B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

A. Provide items of plumbing related equipment and accessories as indicated herein and as illustrated on the Drawings.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 70 00.

B. Indicate on submittal construction materials, finishes, sizes, quantities and related hardware.

C. Product Data:

1. Plumbing fixtures.
2. Carriers.
3. Fixture trim.

D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.

E. Provide closeout documents as required in Division 1, Section 01 70 00.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
2. Provisions specified in this Section.
3. Local Plumbing Code.

1.5 HANDLING

A. Deliver fixtures crated and in undamaged condition.

B. Replace damaged fixtures with new fixtures.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

NOTE: The following manufacturers are considered acceptable, however, products submitted in lieu of specified item shall be equivalent to specified item as determined by the Architect and Engineer.

A. Standard Plumbing Fixtures:

1. American Standard.
2. Kohler.
3. Zurn.
4. Elkay.
5. Just.

B. Carriers:

1. Jay R. Smith.
2. Zurn.
3. Wade.
4. Josam.
5. Watts.

C. Seats:

1. Church.
2. Beneke.
3. Olsonite.
4. Centoco.

D. Faucets:

1. T&S Brass.

E. Flush Valves:

1. Sloan, Royal, or Zurn, Aqua Vantage AV.
2. Sloan, “Sloan”, or Zurn, Aqua Flush Plus.

F. Lead-Free Stop Valve in Hot and Cold Supply Lines to Each Fixture:

1. Chicago.
2. McGuire.
3. T&S Brass.
4. Engineered Brass Company.

G. Stainless Steel Sinks:

1. Elkay.
2. Just.

H. Service Sinks:

1. Fiat
2. Stern Williams.
3. American Standard.
4. Acorn.

I. Electric Water Coolers:

1. Halsey-Taylor.
2. Elkay.
3. Oasis.

2.2 MATERIALS

A. Fittings: Chrome plated heavy cast brass.

B. Nipples: Extra heavy. Provide brass nipples or stainless steel nipples for domestic water systems including nipples at water heater & storage tank connection (no black steel nipples shall be allowed in domestic water systems).

C. Plumbing Fixture Trim: Solid brass, including nuts and washers, handles, hold-down screws, valve bodies, swivel spouts, ferrules, sleeves, locknuts, and bushings.

D. Piping Connections from Shutoff or Stop Valve to Fixture: Chrome plated brass pipe or chrome plated copper tubing.

E. Floor and Wall Escutcheons: Chromium plated with set screws.

F. Exposed Fixture Trimmings and Fittings: Chromium plated brass with polished, bright surfaces.

G. Flush Valves: Non-hold open type, without seat bumpers.

H. Traps: Chrome cast brass adjustable P-traps with cleanout.

2.3 DESIGN AND FABRICATION

A. Plumbing fixture trims shall allow renewable operating units to be removed without detaching supply fitting or faucet.

B. Fixtures, except water closets and urinals, shall have water supply above rim.

C. Equip fixtures with supply discharge below rims with backflow preventers.

D. Furnish angle stops, straight lock shield, loose-key pattern stops for supplies' and install with fixtures. Supplies shall be rigid, unless noted otherwise.

E. Exposed traps and supply pipes for fixtures shall be connected to rough piping systems at wall.

F. All plumbing trim and fixtures indicated on Drawings as handicap shall meet the current requirements of the Americans with Disabilities Act (ADA) and the Texas Accessibility Standards (TAS).

G. Faucets, bubblers, & supply stops shall be National Sanitation Foundation (NSF) Standard 61, Section 9, compliant and listed for residential/drinking water use as required by the Federal Clean Water act effective January 1, 1997 in addition shall be Lead-Free per "Safe Drinking Water Act" U.S. Senate Bill S.3874.

2.4 PLUMBING FIXTURE SCHEDULE

A. WATER CLOSETS:

WC-1 - WATER CLOSET – FLOOR MTD. BACKOUTLET-FLUSH VALVE - STUDENT HANDICAP (ELEMENTARY):

1. Zurn Z5640 ADA/TAS compliant floor mounted, back outlet, siphon jet, elongated bowl vitreous china with 1-1/2" top spud.
2. Flush Valve: Sloan "Royal" 111—1.28 YBYC, 1.28 GPF, polished chrome, externally adjustable, diaphragm type with 1" screwdriver angle stop, metal oscillating handle with sweat solder adaptor kit and cast wall flange with set screw.
3. Seat: Church Model 255SSC, 13/16" thick, solid plastic, white, elongated, open front seat, less cover, combination check and self-sustaining hinges with stainless steel posts.
4. Provide 3" closet bend and wax ring for watertight waste connection.
5. "Critical" mounting height shall meet Texas Handicapped Code.

U-1 - URINAL - HANDICAP:

1. American Standard "Washbrook" # 6590.001, wall hung, siphon jet with raised dome strainer, vitreous china with 3/4" top spud, 14-1/2" elongated, flushing rim and 2" female outlet connection.
2. Flush valve: Sloan "Royal" 186-0.5-YBYC, 0.5 GPF, polished chrome, externally adjustable, diaphragm type, with 3/4" screwdriver angle stop, metal oscillating handle with sweat solder adaptor kit and cast wall flange with set screw.

3. Support: Josam 17800 Series floor mounted carrier with bearing plate.
4. Mounting height as directed by Architect.

ACC-1 - AIR CONDITIONING CONDENSATE

1. Guy Gray Model T-200-LY stainless steel box, 2" drain, less hose valves a supply connectors.
2. Provide stainless steel access door and mounting frame with cylinder lock and key, sized to cover box.
3. Provide cut-off and trap primer inside box. Precision plumbing products, Model "CPO-500".
4. Mounting Height to be 6" AFF. Coordinate location with Architect and Finish Conditions.

ACC-2 - AIR CONDITIONING CONDENSATE

1. 2" hub drain 1" above base of cabinet as close to wall as possible, under sink.
2. Provide cut-off and trap primer under sink, Precision Plumbing Products Model "CPO-500".
3. Coordinate location with Architect and Finish Conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's printed instructions and drawings.

B. Fasten fixtures secured to masonry walls or stud partitions with 1/4" brass toggle or through-bolts.

C. Anchor inserts flush with finished wall and conceal when fixtures are mounted.

D. Fixture Connections:

1. Make connections between earthenware fixtures and flanges on soil pipe gas tight and watertight with closet-setting compound or with neoprene gasket and seal.
2. Do not use natural rubber gaskets or putty for these connections.
3. Bolts shall be not less than 1/4" diameter and shall be equipped with chromium plated nuts and washers.
4. Set fixtures with outlet flanges required distance from floor or wall to make first class joint with gasket and fixture used.

E. Refer to Architectural Drawings for all mounting heights and exact locations. Coordinate with General Contractor prior to starting any work, provide any additional supports, hangers, openings, etc. as required for a complete installation. Coordinate all clearances and locations with other trades as required.

F. Provide stop valve in each hot and cold water supply line to each fixture.

3.2 KITCHEN EQUIPMENT; MILLWORK AND CASEWORK FIXTURES

A. Furnish and install all sinks and other plumbing items shown on furniture, unless shown otherwise. Provide detailed information to the supplier of such furniture as to required cut-outs and drillings, so as to permit proper coordination during fabrication. Provide local shut-off valves in all supplied to such furniture. Provide all waste connections, including drains, p-traps and other materials, using sanitary materials corresponding to piping system material in each case.

3.3 FIXTURES FURNISHED UNDER THIS DIVISION

A. Plumbing fixtures and equipment shall be set in place, leveled and connected as indicated on the drawings. Use china caps to conceal mounting bolts, and grout between all vitreous china fixtures and finished wall and floor surfaces with plaster of paris or portland cement.

B. Install wall hung water closets, lavatories, urinals, sinks and electric water coolers on carriers.

C. Do not install metal fittings until adjoining tile work has been acid- cleaned. The Mechanical Contractor shall be responsible for the proper protection of fixtures after installation.

D. Connections to exposed plumbing fixtures shall be complete with chrome plated brass nipples, tubing, wall escutcheons, etc.

3.4 ADJUSTING AND CLEANING

A. Prior to final acceptance of the work, Mechanical Contractor shall inspect all faucets, flush valves, stop valves, etc., to determine whether they operate properly and discharge proper quantities of water. Connect any deficiencies to satisfaction of Architect's representative.

B. Thoroughly clean all plumbing fixtures, trim and accessories of all tape, adhesives and other foreign materials prior to final acceptance.

END OF SECTION

SECTION 23 00 00

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work in this Division covers all HVAC work specified in all Division 23 Specification Sections and as illustrated on the HVAC Drawings. Comply with other Division 23 Specification Sections as applicable. Refer to other Divisions for coordination of work with other trades.

B. Provide all labor, materials, equipment, transportation, tools and services, and perform all operations required for, and reasonably incidental to, the providing of mechanical system work described in this Division.

C. Contractor shall include providing instructions and demonstrations of the operation of each installed system in its totality to the Owner. Refer to Division 23 specifications for specific Owner training requirements. As a minimum include training of the Owner's Operating Personnel on:

1. Safety Shut-Down of HVAC Equipment.
2. Sequence of HVAC Equipment Operation.

D. Operation and Maintenance of all HVAC Equipment.

E. The Conditions of the Contract, including the General Conditions and Supplementary Conditions, and Division 1 - General Requirements, apply to work covered by this section.

F. Refer to Specification Section 01 32 16 for “Construction Progress Documentation”.

1.2 RELATED DOCUMENTATION

A. Section 01 62 00: Product Requirements.

B. Section 01 78 03: Execution and Closeout Requirements.

C. Section 01 78 39: Closeout Submittals.

1.3 DESCRIPTION OF HVAC DEMOLITION WORK

A. Contractor shall remove several items of materials and equipment under this Section of the Specifications. Equipment and materials to be removed shall be as indicated and noted on the Drawings and as required to facilitate the new installations.

B. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner's Representative.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to Substantial Completion, fully instruct the Owner in the operation, adjustment, and maintenance of products, equipment, and systems; including, but not limited to all HVAC equipment, related accessories and components, temperature controls and the energy management system. Owner shall operate all

systems in cooperation with Contractor for a period of at least five (5) working days prior to, or shortly after, Substantial Completion.

B. Arrange for services of qualified manufacturer's representatives to fully instruct Owner on specialized portions of installations, such as air handling units and auxiliaries; VAV terminal units, automatic temperature controls, and water treatment systems.

C. Arrange for each installer of equipment that requires regular maintenance to meet with Owner to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by trained manufacturer's representatives. Include detailed review of the following items:

1. Operating and Maintenance Manuals.
2. Record Documents.
3. Spare Parts and Materials.
4. Lubricants.
5. Cleaning.
6. Standard and Extended Warranties.
7. Maintenance Requirements, Agreements, and similar continuing commitments.

D. As a part of these instructions for operating equipment, demonstrate the following procedures:

1. Start-Up.
2. Shut-Down.
3. General System Operating Instructions.
4. Emergency Operating Conditions.
5. Noise and Vibration Adjustments, where applicable.
6. Safety Procedures.
7. Economy and Efficiency Adjustments.
8. Effective Energy Utilization.

E. Return at first change of season for changeover from air conditioning to heating, or from heating to air conditioning, to demonstrate system operation in the opposite season.

F. Submit a complete record of instructions as a part of maintenance instructions and the data book (Operations and Maintenance Manual) given to Owner. For each instructional period, supply the following data:

1. Date of Instruction.
2. System or Equipment Involved.
3. Names of Persons Giving Instructions.
4. Other Persons Present.
5. Time Period (in hours/minutes) Instruction Provided.

G. Amount of time to be devoted to instructional sessions shall be reasonable and consistent with the size and complexity of equipment and systems installed and as specified in other sections of these specifications.

3.2 TEMPORARY WORKING ACCESS

A. Each respective trade shall remove existing piping, equipment, fixtures, and other items to provide access for work in existing facilities and on the site. Contractor shall seek Owner's Representative approval prior to removal of any equipment and mechanical appurtenances.

B. Reinstall and refinish items removed, or otherwise damaged, to match existing adjacent surfaces, or new finishes where applicable, upon completion of the work.

3.3 DISRUPTION OF EXISTING FUNCTIONS

A. Access: Access to and use of the existing facilities and site will be restricted, and shall be under the direction and control of the Owner.

B. Disruptions: Maintain existing mechanical, and other existing systems, and maintain all existing functions in service except for those specific portions scheduled for disruption. Where existing functions to remain in use are disrupted, they shall be fully restored after disruption, in full compliance with this Division of the Specifications for new work, as quickly and as reasonably possible.

C. Scheduling of Disruptions: Seek and obtain approval by the Owner two (2) weeks in advance of each event. Failure to schedule such disruptions in advance will result in the Contractor being stopped or rescheduled by the Owner without added cost to the Owner.

D. Notice of Disruption: Date, time and duration of each disruption shall be subject to the Owner's prior written approval and shall include the following information in the form of a memorandum submitted by the Contractor to the Owner's Representative for approval by the Owner:

Facility/System	Date	Starting Time	Duration

E. Emergency Disruptions: When circumstances preclude obtaining advance approval as specified above; make request immediately on knowledge of the requirement, and perform the work so as to cause the minimum amount of disruption, for the minimum duration.

F. Notification: Notify the Owner's Representative and the Owner immediately, by telephone and then in writing, as changes and additions to the scheduled disruption requirements become known.

G. Duration:

1. Complete as large a portion of the work as possible before initiating disruption.
2. Maintain adequate personnel, supplies, materials, equipment, tools, and other resources at job site to avoid unnecessary delay in resumption of normal services.
3. Keep duration of disruption as short as possible.
4. During the disruption, perform only the amount of work that requires the disruption, so as to minimize duration of disruption.

3.4 MODIFICATIONS AND RELOCATIONS

A. Modify, remove, or relocate materials and items indicated on the Drawings or required by the installation of new facilities.

B. Relocations:

1. Repair and restore to good functional condition, equipment, materials and items scheduled for relocation, which are damaged during dismantling or reassembly operations.
2. Remove carefully, in reverse order to original assembly or placement, items which are to be relocated.
3. Protect items until relocation is complete.
4. Clean and repair items to be relocated, and provide new materials, fittings, and appurtenances required to complete the relocations as required to restore them to good operating order.

C. Perform the relocation work in accordance with applicable Sections of these Specifications, utilizing skilled workers.

3.5 SCHEDULE OF WORK

A. Reference Division 1 for Additional Scheduling Information.

B. Contractor and all system installers for each Section of these Specifications shall realize that the present building houses a completely functioning facility that must continue in full operation 16 hours per day during the construction period. Outages of any kind cannot occur, except only when and as the Owner's Representative or Owner may direct otherwise. Under no conditions shall any work be done in the

present building that would interfere with its natural or intended use unless special permission is granted by the Owner.

C. Work under the various specification sections must be expedited and close coordination will be required in executing this work. Various system installers shall perform their portion of the work at such times as directed so as to insure meeting scheduled dates, and to avoid delaying the work of other trades. Owner's Representative will verify scheduled times of work in the various areas involved, each system installer shall cooperate in establishing these times and locations and the system installers shall process their work so as to insure proper execution and completion.

D. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to existing lines, services, or items of equipment in the present building or where existing equipment items or services in that building are to be replaced or modified in any way.

E. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner. New lines shall be installed and tested before connections are made into existing lines, meters, or services.

F. All other modifications to existing piping systems and appurtenances, including necessary interconnections between old and new portions of the various systems, shall be accomplished at times scheduled so as not to interfere with the normal use of the building and the existing systems to which connection is to be made.

G. The use of any type of fastening or hanging device which requires the use of shots or explosives of any nature shall not be used. Explosives shall also not be used for any excavation inside an existing building.

H. Where required by conditions at the site, Contractor shall perform portions of work at night or at other such times as may be required to insure completion of work on schedule. No additional compensation to the Contractor will be paid for such work or required utilities.

I. Contractor shall be available, as deemed necessary for job progress by the Owner, for weekly progress and coordination meetings with the Architect, Engineer, and other Owner's Representatives, when required. These meetings shall be used to monitor progress of submittals, receipt of materials, construction progress, cooperation of trades, field coordination by the Contractor, and to resolve unforeseen conditions in an expeditious manner. Failure to attend meetings, to respond in a timely manner to requests for information, or to progress at an acceptable pace to maintain the construction schedule shall constitute a delay by the Contractor and may be cause for assessment of fees to the Contractor as outlined in Division 1.

J. Provide all temporary connections as necessary to facilitate the phasing of construction, even where not specifically shown. Where temporary work is required it may be required that the Contractor produce a Shop Drawing or field sketch to illustrate the intended methods which shall be submitted for approval by the Architect.

3.6 SALVAGE, DEMOLITION, AND RELOCATION

A. It shall be the responsibility of the Contractor to remove and store those items of existing equipment as indicated on the Drawings to be removed. All items of equipment or fixtures removed shall be protected from damage insofar as is practical.

B. Mechanical items to be removed, salvaged, or relocated shall be removed by the respective trade who would normally be responsible to install new work similar to that to be removed. This shall include whatever selective demolition is necessary to avoid damaging other work of other trades. Each trade shall be responsible for their respective demolition. However, all trades shall keep informed as to the project schedule as it relates to the Demolition Scope of Work.

C. These items shall be stored on site for a minimum of two (2) weeks unless indicated otherwise by the Owner's representative to allow for inspection by the Owner. Deliver, all items tagged to be retained by the Owner to a designated storage location on site or to the Owner's designated Service Center or Warehouse. All items not retained by the Owner shall be removed from the site by the Contractor at no additional cost to the Owner.

D. The attendant piping, ductwork, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No piping, hangers, etc., shall be abandoned in place. Where branch lines are removed, the branch shall be capped as close to the main as possible.

E. Relocations:

1. Repair and restore to good functional condition materials and items scheduled for relocation and/or reuse and which are damaged during dismantling or reassembly operations.
2. New materials and items of like design and quality may be substituted for materials and items indicated to be relocated, in lieu of relocation, upon approval of shop drawings, product data and samples.
3. Remove carefully, in reverse to original assembly or placement, items which are to be relocated.
4. Protect items until relocation is complete.
5. Clean and repair and provide new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order.
6. Perform the relocation work in accordance with pertinent sections of the specifications, utilizing skilled workers.
7. Refer to Drawings for specific requirements of temporary services and relocated equipment and fixtures.

3.7 CLEAN UP

A. Remove all debris, rubbish, and materials resulting from cutting, demolition, or patching operations from the work area on a daily basis.

B. Where such work generates dust and debris take all precautions necessary to prevent dust and debris from accumulating in or on other mechanical and electrical equipment. This may require adding temporary filter media over ventilation air openings of certain types of equipment.

C. At the conclusion of this work clean all building materials, mechanical equipment and electrical equipment so that all items are dust free and operating properly. Where dust causes damage to equipment the Contractor shall make repairs to this equipment at no cost to the Owner.

D. Transport all demolished materials and equipment indicated above in approved containers and legally dispose of all debris off site in a manner approved by the Architect and Owner.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, shall apply to work of this Division, whether attached or not.

B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

A. All Division 23 sections of these specifications shall include all labor and material to complete the entire mechanical systems as specified and shown on the Drawings.

B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.

C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.

D. Refer to "Conditions of Work" in Division 1.

1.3 GENERAL

A. The accompanying Drawings show diagrammatically the sizes and location of the various equipment items and the sizes of the major interconnecting piping and ductwork, without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions and provide proper grading of lines. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.

B. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 23 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.

C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

D. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.

E. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.

F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.4 EXAMINATION OF THE SITE

A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.

B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.

C. All site visits shall be coordinated and scheduled with the Owner.

1.5 CUTTING AND PATCHING

A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.

B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 23, consulting with the Architect regarding proper locations and sizes.

C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, ductwork, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.

D. Holes through concrete shall be drilled with "Mole", "Core-It', or other diamond point hole saw.

E. Refer to Section 01 73 29, Cutting and Patching.

1.6 CODE REQUIREMENTS

A. Contractor is required to comply with the requirements of all National, State, and local codes and utility companies having jurisdiction. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.

B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:

1. (NFPA) National Fire Protection Association.

2. (OSHA) Occupational Safety and Health Administration.
3. (NEC) National Electric Code.
4. (IECC) International Energy Conservation Code.
5. Local Plumbing Code.
6. Local Building Code.
7. Local Mechanical Code.
8. Local Fire Code.
9. Local Energy Code.

C. Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.7 RECORD DRAWINGS

A. Contractor shall, during the execution of work, maintain a complete set of “Record Drawings” upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Builts" at Project Close- Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.

B. All “Record Drawings” shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.

C. Refer to Section 01 78 39, Project Record Documents.

1.8 RECORDS AND INSTRUCTIONS FOR OWNER

A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Section 01 78 23 & 01 78 39:

1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.
4. Operating instructions for heating and cooling and other mechanical systems. Operating instructions shall include recommended maintenance and seasonal change-over procedures.
5. Other data and drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
7. Valve tag charts and diagrams specified elsewhere herein.
8. "As-Built" Record Drawings shall be provided in electronic format on a CD (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
9. Provide copies of all City Inspection Certificates of Approval.
10. Provide Contractor's Certification Statement that all equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.

B. Provide not less than one (1) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of all equipment.

C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.

D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all ductwork, equipment, and materials designated on the Drawings and specified herein. A minimum of four (4) hard copies or one (1) electronic copy of each shall be submitted or submittal shall be transmitted electronically. Additional copies will be required when indicated by the Architect and as required for project coordination.

B. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgement of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.

C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.

D. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.

E. Shop Drawings are not intended to cover detailed quantitative lists of heating specialties, valves, air distribution devices, fixtures, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.

F. Shop Drawings prepared to illustrate how equipment, piping, ducts, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.

G. Various material submissions of such items as air devices, plumbing fixtures, drains, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets for each item submitted shall have sufficient bare space to allow for shop drawing review stamps.

H. Contractor shall process his submitted data to insure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.

I. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents.

J. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.10 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 84 00, Fire-Stopping.

1.11 DRAWINGS

A. Drawings show diagrammatically the locations of the various pipes, ductwork, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.

B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.

D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.

E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.12 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 23.

B. Furnish materials and labor required for the connection of this equipment.

C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.13 COOPERATION

A. Coordinate all work indicated in Division 23 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.

B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.

C. Should any questions arise between work specified in Division 23 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.14 MATERIALS AND EQUIPMENT

A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed.

B. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Section 01 62 00, Product Options. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.

C. Listed Manufacturers:

1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.

D. Product Options:

1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.
4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

E. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.
5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

F. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

G. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

H. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.15 EQUIPMENT SIZES AND REQUIREMENTS

A. Space allocations in machinery and mechanical equipment spaces are based on equipment scheduled in each case. Should the Contractor request a substitution for equipment of another make that requires more space in any critical dimension, the Contractor shall submit, together with other submittal data on the equipment, prints of drawings indicating how the equipment may be installed, indicating room for servicing and revisions in piping or ducting and any other details necessary for the Architect to form a judgement as to the suitability of the substitute material, as to performance, suitability for the space and other variables.

B. Duties of certain equipment items, horsepowers of driving motors and electrical characteristics are scheduled for equipment items of a particular make in each case. Should requests for a substitute material be accepted which has other requirements that would involve allied equipment or other portions of work, the Contractor shall be responsible for all modifications required at no change in contract price. As examples:

1. If an accepted A/C Unit has a brake horsepower requirement above the motor horsepower scheduled, the Contractor shall be responsible for providing a larger motor and heavier drive and any change in size of the protective device, conduit run and conductors serving that motor. The latter shall be extended through an individual branch protective device and branch circuit on through the panel, feeder, feeder protective device, etc.
2. If accepted, heat exchangers, coils, etc., having greater pressure drops than those on which pumping heads were based, the Contractor shall be responsible for selecting proper pumps and drives and adjusting electrical service work accordingly.

C. Structural steel members are indicated to provide supports for certain specific sizes and weights of equipment. Should a substitution request involve other equipment, the spacing of the supports shall be varied to suite the equipment. Should the weight or size of a proposed substituted item of equipment require additional supporting steel members, the Contractor shall include documentation of the additional supports in the request for substitution and install them at no change in contract price if the substitution is accepted.

D. Various large apparatus to be installed may require that the apparatus be installed prior to the installation of portions of structural, walls, or door frames. Coordinate the installation of these items to insure that no demolition of general construction is necessary for equipment installation or that the apparatus does not have to be disassembled for installation.

1.16 STORAGE AND PROTECTION OF MATERIALS

A. Store and protect materials and equipment as specified in Section 01 66 00, Product Storage and Handling Requirements.

B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.

C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.17 FOUNDATIONS

A. Provide equipment foundations associated with the work specified in Division 23.

B. All top corners and edges of all foundations shall be neatly chambered at a one inch (1") high 45 degree angle.

C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.

D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.

E. Unless otherwise noted, foundations shall be four inches (4") thick elsewhere for low pressure rated air handling units and other mechanical equipment, unless specifically noted otherwise on the Drawings.

F. All concrete work shall conform to the requirements of Section 03 30 00, Cast-in-Place Concrete.

G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 23 specifications. Pads shall be a minimum of 4 inches thick extend a minimum of two inches (2") in each direction beyond the equipment size.

1.18 EXCAVATION AND BACKFILLING

A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.

B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.

1.19 WIRING

A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.

B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.

C. All power for control circuits required for the Temperature Control System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.

D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.

E. All motors furnished as a portion of work specified in Division 23 shall be wired as specified in Division 26.

F. Except where combination starter-disconnects are specified elsewhere herein or in Division 16, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.

G. Furnish all necessary wiring diagrams for equipment specified in Division 23, as a part of equipment submittals, for installation under other sections of these specifications.

1.20 EQUIPMENT STANDARDS

A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.

B. First of a kind new technology devices will not be considered.

C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.21 DEHUMIDIFICATION OF BUILDING

A. It shall be the Contractor's responsibility to properly and thoroughly dry out all building materials used for construction of the building, as well as to dry out the building and dehumidify the spaces prior to activating the HVAC System. Extra precautions should be taken by the Contractor not to allow excessive humidity to develop in the building prior to final connection and activation of the HVAC System. Should it become necessary, the Contractor shall procure the required equipment (multiple portable dehumidifiers, as required to include temporary power thereto) to properly dry and dehumidify the building materials and spaces so as not to force the HVAC System to perform beyond its intended abilities.

B. Contractor shall be responsible for all costs in connection with repair and/or activation to the building and its HVAC Systems should excess moisture cause damage thereto.

C. Contractor shall provide proof of dehumidification by furnishing temperature and humidity readings for each section of the building as measured and recorded by an independent agent approved by the Owner/Architect. Provide these readings to the Owner's representative prior to the building HVAC system being activated and also furnish with the Project Close-Out documents.

D. The inside building Dew Point shall not exceed 55 Deg.F. for a period of 24 consecutive hours or for a total of 24 hours in a 7 day time period.

1.22 CLEAN UP

A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.

B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.

C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, ductwork, and equipment.

D. Refer to Division 1.

1.23 FINAL CONSTRUCTION REVIEW

A. Schedule: Upon completion of the work specified in Division 23, there shall be a final construction review of the completed mechanical systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed, tested, adjusted, and balanced in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.

B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.

C. Building mechanical systems shall have been in operation for a minimum of 15 days and Test and Balance work shall be substantially complete prior to this review.

D. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.24 CERTIFICATIONS

A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.

B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.25 GUARANTEE

A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance.

B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.

C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide motors for all mechanical equipment furnished under Division 23, as indicated herein and as illustrated on the Contract Drawings.

B. All motors shall be of the same manufacture for like pieces of equipment; i.e., air handling units shall have motors of the same manufacturer. Pumps shall have motors of the same manufacturer, but both types of equipment are not required to have the same motor manufacturer.

C. The following equipment with 3 phase 1 horsepower motors or larger shall be provided with NEMA Premium efficiency motors as specified herein:

1. None for this project scope.

D. Three phase, horizontal, NEMA frame induction motors served by AC Adjustable Frequency Motor Controllers shall be designed to meet the intent of NEMA MG1, Part 31, Section 31.40.4.2 regarding voltage spikes without exception.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 23 and 23 05 00.

B. Indicate on submittal the motors proposed for each system of equipment to be installed. This shall be in tabular form in one location for each type of equipment submitted. The lack of this information will be grounds for rejection of equipment submittals.

C. Product Data shall be furnished which shall include:

1. Motor Manufacturer.
2. Motor Type; Open Drip Proof, Totally Enclosed (Fan Cooled or Air Over).
3. Model of Manufacturer.
4. Motor Horsepower.
5. Motor RPM.
6. NEMA Motor Efficiency at 25%, 50%, 75%, and 100% of Full Load Rating for motors served by variable frequency drives; 100% only for constant speed motors 1 HP and larger.
7. Power Factor at 25%, 50%, 75%, and 100% of Full Load Rating for motors served by variable frequency drives; 100% only for constant speed motors 1 HP and larger.
8. Service Factor.

D. Certification: Provide manufacturer's literature indicating NEMA premium motor efficiency as tested in accordance with IEEE Standard 112, Test Method B. Provide documentation to verify motors served by variable frequency drives meet NEMA MG1, Part 30 for 6-step drives and Part 31 for PWM drives.

E. Provide closeout documents as required in Division 1.

1.4 QUALITY ASSURANCE

A. Comply with all regulatory requirements in the following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
2. Provisions specified in this Section of Specifications.
3. Applicable provisions of standards of National Electric Code (NEC).

B. Manufacturer shall have been manufacturing the motors as described herein for a minimum of ten (10) years.

PART 2 - PRODUCTS

2.1 ELECTRICAL MOTORS, GENERAL

A. All motors furnished under any of the several sections of these specifications shall be of a recognized manufacturer, be of adequate capacity for the loads involved, and wound for the electrical characteristics indicated on the Drawings and specified herein. Verify all job site voltages and power source available before submitting, ordering and installing any motor or related controls.

B. Motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association (NEMA) as shown in their latest publication.

C. Motors shall be furnished with an open-frame, unless otherwise noted, or required by the NEC for the service conditions encountered. Motors exposed to weather shall be the totally enclosed type suitable for installation in ambient conditions for exposure to the sun, heat, and rain. Provide explosion proof motors where indicated and as required for the hazard in which to be installed.

D. Unless otherwise noted, fractional motors rated at 1/2 horsepower and less shall be single phase, the motors rated at larger than 1/2 horsepower shall be three phase. Single phase motors shall be arranged for across-the-line starting.

E. Single phase motors shall be capacitor start, induction run type, and shall be furnished with motor controller with pilot light where scheduled or indicated. Refer to Section 23 05 14.

F. All motors shall be of the same manufacturer on similar equipment furnished by the same manufacturer, unless they are an integral part of the piece of equipment to which they are attached, such as a chiller. Air Handling Units shall have motors of the same manufacture and pumps shall have motors of the same manufacture; but, pumps and air handling units are not required to have motors of the same manufacturer.

G. Three phase motors shall generally have the following characteristics:

1. All copper windings.
2. Type K, NEMA Design "B".
3. Normal Starting Torque.
4. Class B insulation.
5. Continuous Duty Rated.
6. 40 Deg.C. ambient rated.
7. Minimum 1.15 Service factor on motors 1 horsepower and larger; 1.25 service factor on motors 3/4 horsepower and smaller.
8. 1800 RPM unless scheduled otherwise.
9. Oversize steel conduit boxes.
10. Greasable bearings.
11. Stainless steel or aluminum motor nameplates for standard motor information.
12. Cold rolled steel 1045 shaft.
13. Steel frame and splash cover.

H. Where other sections of specifications do not call for premium efficiency motors this section shall apply to motor requirements. Where premium efficiency motors are required in the other Sections of these Specifications refer to Article 2.2 herein.

I. Motor manufacturers shall be Reliance, Baldor, General Electric, A.O. Smith or U.S. Motors. Other manufacturers will not be considered.

2.2 PREMIUM EFFICIENCY ELECTRICAL MOTORS

A. All premium efficiency electrical motors furnished under any of the several sections of these specifications shall be of a recognized manufacturer, be of adequate capacity for the loads involved, and wound for the electrical characteristics indicated on the Drawings and specified herein. Verify all job site voltages and power source available before submitting, ordering and installing any motor or related controls.

B. Motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association (NEMA) as shown in their latest publication.

C. Motors shall be furnished with an open-frame, unless otherwise noted, or required by the NEC for the service conditions encountered. Motors exposed to weather shall be the totally enclosed type suitable for installation in ambient conditions for exposure to the sun, heat, and rain. Provide explosion proof motors where indicated and as required for the hazard in which to be installed.

D. All NEMA Premium efficiency motors shall be three phase.

E. Except as otherwise specified NEMA Premium efficiency motors shall be drip-proof, squirrel cage, premium efficiency type as manufactured by A. O. Smith (E Plus III), Baldor (Super E), Reliance (Duty Master XE), General Electric (Energy Saver), or U.S. Motors Premium Efficiency NEMA Design B, induction type rated for constant duty with 40 Deg.C. ambient temperature rise. The motors shall have the following characteristics:

1. 1800 RPM unless scheduled otherwise.
2. 1.15 Service Factor.
3. Rigid base.
4. Serialized and certified.
5. Stainless steel nameplate.
6. Class B insulated.
7. 60 Hertz.
8. High power factor.
9. Ball Bearings.

F. Totally enclosed motors and motors served by variable frequency drives shall be Class F insulated.

G. Minimum Nominal motor efficiencies at 1800 RPM, 460V or 208V, 4 pole (as noted on drawings), full-load, per IEEE Standard 112, test method B, as defined by NEMA MG1-12.53, a and b, shall be as follows, along with minimum power factor:

MOTOR HP	NOMINAL EFFICIENCY		POWER FACTOR	
	TEFC	ODP	TEFC	ODP
1	85.5	85.5	84.0	84.0
1.5	86.5	86.5	85.7	85.7
2	86.5	86.5	85.7	85.7
3	89.5	89.5	85.5	85.5
5	90.2	89.5	88.0	88.0
7.5	91.0	91.0	82.0	82.0
10	91.7	91.7	82.0	82.0
15	92.4	93.0	86.0	83.5
20	93.0	93.0	86.5	84.5
25	93.0	93.6	87.5	87.0
30	93.6	94.1	88.5	87.0
40	94.1	94.1	89.0	87.0

H. Furnish submittal data on all NEMA Premium efficiency motors furnished to include motor efficiencies as rated in accordance with IEEE Standard 112, Test Method B.

I. All motors shall be of the same manufacturer on similar equipment furnished by the same manufacturer, unless they are an integral part of the piece of equipment to which they are attached, such as a chiller. Air Handling Units shall have motors of the same manufacture' and pumps shall have motors of the same manufacture; but, pumps and air handling units are not required to have motors of the same manufacturer.

J. Each premium efficiency motor shall be warranted for a minimum of three (3) years.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Motors shall typically be furnished by the manufacturer of the equipment which the motor will serve.

B. Motors shall be factory installed in the equipment and be mounted on equipment bases, wired to a terminal box, connected to the mechanical device to be rotated, and factory run tested.

C. When project schedules will not allow the above due to excessive lead time requirements, the Contractor shall do one of the following all at no additional cost:

1. Locally procure the specified motors, while meeting all of the above requirements, and field install the motors on the equipment in accordance with the manufacturer's installation instructions.
2. Accept factory installed standard efficiency motors and replace with high efficiency motors as noted above.

D. Motors disconnects will be furnished and installed under Division 26, unless integral with, or specified to be a part of, the equipment as indicated elsewhere in other sections of these Specifications. The wiring to the motor and installation of the motor controller, if not specified to be integral with the equipment, as furnished under other sections of these specifications, shall also be installed under Division 26.

E. Interlock and control voltage wiring shall be installed as outlined in other Sections of these Specifications.

END OF SECTION

SECTION 23 05 14

COMMON MOTOR STARTER REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

A. Provide a complete system of motor starters as indicated herein and as illustrated on the contract Drawings.

B. Provide other devices as indicated for control of motors and interface with automation or control systems, and as further required by the local authorities having jurisdiction.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Indicate on submittal the starter type proposed to be used for each system and for the various sizes of motors required to be installed. This shall be in tabular form with attached cut sheets.

C. Product Data:

1. Snap Action Manual Motor Starters.
2. Magnetic Across-the-Line Motor Starters.
3. Control Transformers.
4. Hand-Off-Automatic Switches.
5. Pilot Lights.
6. Number and Type of Auxiliary Contacts.
7. NEMA Enclosure Type.
8. Power and Control Wiring Diagrams.

D. Provide closeout documents as required in Division 1 at Substantial Completion.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in following order of precedence:

1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
2. Provisions specified in this Section.
3. Applicable provisions and standards of the National Electric Code (NEC).

B. Manufacturer shall have been manufacturing the product proposed to be used as described herein for a minimum of ten (10) years; or it shall essentially duplicate a product line that has been manufactured for that length of time.

C. Source Quality Control:

1. Manufacturer's tests to meet applicable Underwriters' Laboratories, Inc., Standards.
2. Equipment designed and manufactured to meet applicable ANSI, NEMA, and IEEE Standards.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

A. Except as specified otherwise, a starter providing overload protection shall be furnished with each motor provided in Division 23, under this section of the specifications, unless:

1. Starters are provided in Division 26 as part of a motor control center, or
2. Starters are furnished under Division 26 as a combination motor starter-disconnect.
3. Disconnects on fractional horsepower motors are not substitutes for a motor controller (starter). However, a motor controller on these size motors may substitute for a disconnect only where the required location for both is in the same location.
4. Unit heater and ceiling fan fractional horsepower, motors, 1/8 HP or smaller, with inherent thermal overload protection are not required to have motor starters.

B. Each starter furnished herein shall have a NEMA horsepower capacity rating within the required limits of the motor which it serves.

C. Unless otherwise indicated, starters mounted indoors shall be furnished with NEMA Type 1 enclosures, and those exposed to the weather shall be furnished with NEMA Type 3 enclosures.

D. Each three phase starter shall be provided with three thermal overload protection relays, one in each phase, be of the full voltage, across-the-line, non-reversing, single or two-speed, magnetic controller type. Overload relays shall be reset from outside the starter enclosure by means of an insulated bar or button.

E. Starters shall have auxiliary contacts as required to comply with provision for electrical interlocks as defined hereinafter. Provide a minimum of one (1) normally open (N.O.) and one (1) normally closed (N.C.) auxiliary contacts with each three (3) phase starter. Where used, the secondary side of the control transformer shall be grounded and the other side shall be fused. Where starters are interlocked, the starter holding coils shall be of one voltage. Where starter line voltages are different and above 120 volts to ground, provide control voltage transformers in the starters that are interlocked. The control systems installer shall supply all electrical power supply and transformers as needed to serve control circuit requirements for temperature controls. Control voltage in each starter shall be not more than 120 volts to ground, with an individual control transformer provided in each interlocked starter. Control safety circuits shall de-energize the respective motors served via holding coils in the respective starter.

F. Manual starters for fractional horsepower single phase motors shall be on-off, or snap action switch type combined with thermal overload device. The switch shall be so constructed that it cannot be held closed under a sustained motor overload. This shall be equal to an Allen Bradley No. 600-TAX216, toggle switch with neon pilot light and NEMA 1 enclosure unless indicated otherwise for severe duty.

G. Provide starter covers with Hand-Off-Auto Switch and pilot light where equipment is interlocked or remotely controlled. Provide starter covers with Start-Stop buttons and neon pilot lights where equipment is locally controlled.

H. The Hand-Off-Auto Switches shall be so wired that, when in automatic position, the control of their motors is transferred to the control system as outlined elsewhere herein; and, when in hand position, they themselves assume control of their motors irrespective of the remainder of the equipment, although the temperature control sequences shall operate the same while in either the "Hand" or "Auto" position. Safety devices will not be bypassed when in "Hand" position.

I. Coordinate the purchase of all starting equipment, insofar as practical, such that all starting equipment on the project shall be of the same manufacturer.

J. Starters shall be a regularly manufactured product to meet the intent of all requirements specified herein.

K. Acceptable starters and controllers shall be manufactured by

1. Allen-Bradley.
2. General Electric.

3. Cutler-Hammer.
4. Square D.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All starters furnished under this section of the Specifications shall be installed under Division 26 of the specifications.

B. Securely mount all starters level against walls where shown to be fully accessible and convenient for use. Where not specifically shown locate in a convenient and fully accessible location in a Mechanical Room, Electrical Room, Janitor Closet, Storage Room or above accessible lay-in ceiling when no higher than six inches (6") above the finished ceiling height and mounted to a wall or physically secure and stable surface.

C. Where no wall exists for installation, furnish a unistrut fabricated stand secured to the floor, or other suitable structure. Use corrosion resistant fasteners.

D. Where motor starters are ganged together, mount, insofar as is practical, all at the same distance from the floor, or other referenced point, to the bottom of the starters.

E. Refer to manufacturer's wiring diagrams for proper wiring procedures.

F. Wire all safety devices in series to be active in both the "Hand" and "Auto" position.

G. Coordinate starter type and size with motor manufacturer's data for equipment actually installed.

H. Field verify correct sizes of replaceable thermal overload elements for each motor actually installed. Do not over or under size elements.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

A. A complete system of vibration isolation for all mechanical equipment subject to the transmission of noise and vibration to the building.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the best quality and have been manufactured by a firm with a minimum of five (5) years of experience in this field.

B. All equipment and materials shall be installed in a workmanlike manner by experienced mechanics and as recommended by the equipment and vibration isolation manufacturers.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions for all vibration isolation equipment.

B. Shop Drawings: Submit in accordance with Section 23 05 00.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall be rejected.

B. Storage and protection of materials shall be in accordance with Section 23 05 00.

C. Install materials and equipment at the proper time to keep pace with the general construction and the work of other trades involved so as not to delay the project completion schedule.

PART 2 - PRODUCTS

2.1 GENERAL

A. Objectionable vibration or noise created in any part of the building by the operation of any equipment furnished and/or installed under Division 23 will not be permissible.

B. Contractor shall take all precautions against the same by isolating the various items of equipment, pipes, and ducts from the building structure and by such other means as may be necessary to eliminate the transmission of excessive vibration and objectionable noise produced by any equipment installed thereby.

C. Design all foundations, supports, etc., for equipment, piping and ductwork with this end in view.

D. Contractor shall supervise and instruct the construction of all foundations and supports, in order that they may be constructed in such manner as to prevent the transmission of noise and vibration.

2.2 APPLICATIONS

A. Isolating material shall be selected in each case in accordance with the manufacturer's recommendations and the latter shall be prepared to demonstrate, upon request of the Architect, the isolation effectiveness of the material which has been installed upon his recommendation.

B. Isolators shall be so selected that when all the items in each of the mechanical rooms are in simultaneous operation, the vibration transmission to the building at the lowest disturbing frequency shall be limited to a maximum of 10% for a mechanical equipment room floor that is on the ground and 5% for all other building surfaces, including those in fan rooms, from all the equipment when the various items are in harmony.

C. Isolators for supporting Fans suspended from the construction above on rod hangers, not internally isolated, shall be of the open spring type with housings and noise washers, lock washers, nuts, etc. Isolators shall be similar to Amber Booth type BSW-1 or 2 or KDXW-1 or 2 with a minimum 1 inch deflection for fans and 2 inch deflection for air handling units. For fans and A/C units less than 1000 CFM in capacity they may be isolated with rubber-in-shear isolating grommets in lieu of spring isolators.

D. For all curb mounted fans and condensing units use two inch (2") wide x 3/8" thick neoprene isolation strips to be in continuous contact at all curb to equipment contact areas.

2.3 MANUFACTURER

A. Isolating material used shall be equivalent to Amber-Booth, Peabody, Korfund Vibration Mountings, or Mason.

PART 3 - EXECUTION

3.1 PERFORMANCE OF ISOLATORS

A. Comply with recommendations set forth by the American Society of Heating, Refrigerating and Air Conditioning Engineers for the selection and application of vibration isolation materials and units.

B. Comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

C. Place isolators where indicated and where specified herein. Coordinate all isolator selections with approved equipment and other pertinent shop drawings of exact equipment to be isolated. Verify to ensure accuracy of load points and take into account any accessory devices adding to equipment loads to be supported by isolators.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC EQUIPMENT AND PIPING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

A. Provide a complete system of Piping Identification as specified herein for each of the systems as described herein.

B. Provide a complete system of equipment identification tags as described herein.

1.3 QUALITY ASSURANCE

A. The installation of all mechanical system identification devices shall be performed under this Section of the Specifications using materials which are the product of reputable manufacturers. The application of the materials shall be in strict accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.

B. Manufactured Piping Identification markers, equipment name plates and valve tags shall be a product of Seton Name Plate Corporation, EMED Company, Inc., or Craftmark Identification to meet all ANSI Standards pertaining thereto.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions in accordance with Section 23 05 00.

B. Shop Drawings:

1. Submit a list of all piping systems to be identified, color of background to be used, legend or wording to be displayed for each system, and the intended location of all markers to be displayed.
2. Submit a list of equipment to receive identification tags, cut sheets and proof copies of tags which indicate location of tag and wording to be engraved thereon.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Storage and protection of materials shall be in accordance with Section 23 05 00.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION SYSTEM

A. Furnish piping identification markers for all insulated and uninsulated piping systems in sizes and colors in accordance with ANSI Standard A13.1. Markers shall be as manufactured by Seton Name Plate

Corporation similar to their vinyl plastic "Setmark" pipe markers with flow arrows. For systems with overall outside diameters under 6" use the snap-around markers. For systems with overall diameters 6" and over use strap-around markers attached with nylon ties.

B. Markers shall be provided as a minimum for the following systems:

1. Condensate Drains (Green or yellow background), for all insulated drains not contained in one space or roof; i.e., an A/C condensate drain in a fan room shall not require identification, whereas, as drain extending to another space would. Provide separate markers for condensate and auxiliary drain lines.
2. Refrigerant Liquid (Yellow background).
3. Refrigerant Suction (Yellow background).

C. Refer to Section 09 91 23 for color code paint requirements for all exposed mechanical equipment and piping.

2.2 EQUIPMENT IDENTIFICATION

A. This Contractor shall provide identification plates similar and equal to Seton Name Plates, Style 2060.

B. Name plates shall be a minimum of 1/16" thick and 1" X 3" in size with beveled edges. The surface shall be a black satin with a white core for lettering. Each plate shall be drilled with two mounting holes sized for 3/8" No. 3 round head nickel plated steel screws. Lettering shall be a minimum of 3/16" high. Lettering shall be cut through the black surface to the white core. Only name plates equal to those specified will be considered. No punched plastic tape or engraved aluminum plates are acceptable. Stick-on only plates are not acceptable.

C. Provide and install identification plates on the cover of all starters or disconnects or combination starter-disconnects, where not mounted directly on the equipment, delivered by the mechanical system installer to the electrical systems installer and on each piece of Mechanical Equipment to include but not necessarily limited to:

1. Exhaust Air Fans.
2. Split DX A/C Units.
3. Condensing Units.

D. Name plates shall have complete words describing equipment type, use and service. As an example, air handlers shall be designated "AHU-S-X MEP Shop" to designate the equipment as an air handler, number of air handler and area served. Use multiple or larger name plates as required to fulfill this requirement.

PART 3 - EXECUTION

3.1 PIPE MARKER INSTALLATION

A. Provide flow arrows at each marker location.

B. Markers shall be spaced not more than 30 feet on center and at each change of direction but not more than 4 feet in each direction from each elbow and tee.

C. Identification markers shall be installed on all new piping; indoors, outdoors and in the crawl space except for drain and waste lines 3/4" and smaller.

D. Install markers on exposed piping systems only after jacketing systems and finish paint coats are complete. Refer to Sections 09 91 23 and 23 07 00.

3.2 IDENTIFICATION TAG INSTALLATION

A. Secure tags level and in a conspicuous location with adhesive on equipment starters or combination starter disconnects and on the equipment where starters are not immediately adjacent to the equipment served.

B. Additionally, secure all tags with screw fasteners after secured with adhesive.

C. Provide and install an additional identification plate mounted on the ceiling grid (lay-in Clg) or on access door (Hard Clgs.) for all above ceiling mounted equipment.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING (TAB) FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section shall be related to the General Provisions of the contract, including General and supplementary conditions.

B. Refer to Section 23 0500 for General Provisions.

1.2 SCOPE OF WORK

A. The work included in this Section consists of the furnishing of all labor, instruments, tools and services required in connection with the Testing, Adjusting and Balancing (TAB) of the Heating, Ventilating and Air Conditioning (HVAC) systems as described in the mechanical specifications and shown on the mechanical Drawings, or reasonably implied therefrom, to include the overall commissioning of systems and subsystems such as verification of operation of each control device and all equipment sequences of operation.

B. TAB of the HVAC systems will be performed by an impartial Technical Firm who is a member of the Associated Air Balance Council (AABC) and whose operations are limited only to the field of professional TAB work. TAB services shall be paid by allowance in general Contractor's scope. District shall select the TAB form at an early stage of the project and notify the Contractor if TAB firm that shall be employed.

C. TAB Firm is responsible to and shall submit all reports directly to the Architect/Engineer and as requested to the Owner.

D. TAB services shall result in the optimum temperature, humidity, airflow, ventilation rates, and noise levels in the conditioned spaces of the building.

E. The following basic components of the HVAC systems shall be tested, adjusted and balanced:

1. Air distribution systems.
2. Air moving equipment.
3. Cooling systems.
4. Heating systems.
5. Control systems verification to include end devices, control sequences of operation and energy management system control and monitoring point verification.

F. Document Review

1. The TAB Firm shall be responsible for reviewing the HVAC Drawings and specifications relating to the TAB services for proper arrangement and adequate provisions of devices for testing, adjusting and balancing.
2. TAB Firm shall review HVAC manufacturer's submittal data relative to balanceability.
3. TAB Firm shall review submitted HVAC automatic temperature control sequences for conformity to the specifications.

G. Three (3) hard bound copies and three (3) .PDF file copies saved onto Compact Disks of final report shall be submitted to the owner, or representative thereof, indicating a summary of actual operating data and any abnormal operating conditions. The report will contain all required information as described within this specification.

1.3 SERVICES OF CONTRACTOR

A. Contractor shall start up and test all materials and equipment which normally require testing. All piping, ductwork, etc., shall be tested to meet code requirements or the specification requirements, whichever is the more stringent. All equipment shall operate a sufficient length of time at the Contractor's expense to prove to the Engineer, and Owner that the equipment is free from mechanical defects, runs smoothly and quietly and performs satisfactorily to meet the requirements set forth in the Mechanical Drawings and Specifications.

B. In order that all HVAC systems can be properly tested, adjusted and balanced, the Contractor shall operate the HVAC systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB, and shall further operate and pay all costs of operation during the TAB period. Operating expenses to be paid for by the Contractor (not TAB firm) will include, but not necessarily be limited to, the following:

1. Utility costs; electrical, gas, etc., as applicable.
2. Personnel costs to start, operate and stop all HVAC equipment.
3. All start-up labor and materials costs.
4. All maintenance costs.

C. The drawings and specifications have indicated valves, dampers and miscellaneous adjustment devices for the purpose of testing, adjusting and balancing the HVAC systems to obtain optimum operating conditions. It will be the responsibility of the Contractor to install these devices in a manner that will leave them fully accessible and readily adjustable to include access to allow recording of all motor and fan nameplate data. The TAB firm shall be consulted if there is a questionable arrangement of a control or adjustable device. Should any such device not be readily accessible, the Contractor shall provide access as required by the TAB firm.

D. Contractor shall provide and coordinate the services of qualified, responsible sub-contractors, suppliers, and personnel as required to correct, repair or replace any and all deficient items or conditions found before and during the TAB period.

E. As a part of this Project Contract, the Contractor shall make any changes in the sheaves, belts, motors, and dampers, or the addition of dampers as required, to correctly balance the HVAC systems as required by the TAB firm at no additional cost.

F. Provide sufficient time in Project Contract completion schedule to permit the completion of TAB services prior to Owner occupancy of the project.

G. Contractor shall furnish without charge to the TAB Firm:

1. One set of mechanical specifications.
2. All pertinent change orders and Addenda.
3. Two complete sets of mechanical plans with latest revisions.
4. "As-installed" drawings.
5. Approved control diagrams.
6. Approved manufacturer's submittals for all HVAC equipment.

H. Have all HVAC systems complete and in operational readiness prior to notifying the TAB Firm that the project is ready for TAB services. So certify in writing to the Engineer, and Owner that such a condition exists. Complete operational readiness prior to commencement of TAB Services shall include the following:

1. Construction status of building shall permit the closing of doors and windows, ceilings installed, etc., to permit the obtaining of projected actual operating conditions.
2. Air Distribution Systems:

a. Verify installation for conformity to design of all supply, return and exhaust ducts. Document and certify that all duct leakage tests as required by the mechanical specifications have been performed and the test results are within specified limits (provide copies of leakage test results). TAB firm shall be notified of the time when all leakage tests are to be conducted to allow them to witness as needed.
b. Verify that all volume dampers, smoke dampers and fire dampers are properly located, functional and open; verify that properly located, sized, and labeled access doors are installed in ducts and in general construction (ceilings, walls, furrings, etc.).

    1) Contractor shall manually release the fire, smoke or fire-smoke damper which shall be witnessed by the TAB firm or local municipality representative; to observe the full opening and closing of the dampers. Document these witness tests in writing.
    2) Contractor shall open or reset fusible links on these dampers, as required.
    3) Contractor shall furnish tags at each damper for recording the date, time and individual who last verified the operation of each damper.

c. Verify that minimum outside air, maximum outside air, return air and relief air dampers provide tight closure, open fully and operate smoothly and freely.
d. Verify that all supply, return, exhaust and transfer air diffusers, grilles and registers are installed as indicated on the mechanical Drawings.
e. Install clean filters at each air handling unit and maintain these filters for the complete period that the subject system is being tested, adjusted, and balanced. Refer to Section 23 3000.
f. Verify that all (supply, return, relief and exhaust) fans are operational including proper fan rotation, operates free from vibrations, belts are properly aligned, and belt tension is proper.
g. Verify that all motor starter overload heater elements are of proper size and rating; nameplate amperage to be within the range of the heater element size.
h. Make a record of actual motor amperage and voltage, per phase, and verify that they do not exceed nameplate ratings.
i. Verify specified vibration isolation accessories are correctly installed and adjusted.
j. Insure that all fan drive components, motors, belts, sheaves, and fan wheels are all accessible to allow for servicing and verification of name plate data, sizes, and model and serial numbers, as applicable.

I. Automatic Controls:

1. Verify that all control components are installed in accordance with project requirements and are functional as intended by these specifications, including all electrical interlocks, damper sequences, air temperature resets, duct smoke detectors, safeties, etc.
2. Verify that all controlling instruments are calibrated and set for designed operating conditions with the exception of room thermostats which shall be calibrated at the completion of TAB services with cooperation between TAB Firm and controls system installer.
3. Automatic temperature control and/or energy management system installer shall thoroughly check all controls, sensors operators, sequences of operation, etc. before notifying the TAB agency that the automatic temperature controls and energy management system are operational. Automatic temperature control and/or energy management system installer shall provide technical support (technicians and necessary hardware and software) to the TAB agency to allow for a complete check out of these systems.
4. The scope of the TAB work as defined herein is indicated in order that the contractor will be apprised of his responsibility regarding the coordination and assistance required to complete the project requirements for final TAB. The TAB Firm will be responsible to the Engineer, and Owner for the satisfactory execution of the TAB services.

1.4 SERVICES OF THE TAB FIRM

A. TAB Firm Qualifications:

1. TAB Firm shall be one which is organized to provide independent professional testing, adjusting and balancing services. The firm shall have one (1) Professional Engineer licensed in the State of Texas, with current registration.

2. TAB Firm shall have operated a minimum of ten (10) years, under its current firm name.
3. All personnel used on the job site shall be either TAB engineers or TAB technicians, who shall have been permanent, full-time employees of the Firm for a minimum of one (1) year prior to working on this specific project.
4. TAB Firm shall submit the following to the Engineer and/or Owner for approval prior to commencing services:

    a. Name and biographical data of the Professional Engineer and all personnel to be assigned to this project.
    b. Proof of company operation for a minimum of ten (10) years.

B. TAB Firm Responsibilities:

1. Liaison: The TAB personnel on the job shall act as liaison between the Engineer, Owner and Contractor.
2. Inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the HVAC systems during the early construction stages, and at other appropriate stages, for the purpose of reviewing that part of the work relating to proper arrangement and adequate provisions for TAB.
3. When performing inspection services prepare a punch list to be copied to the Engineer and Contractor noting observed deficiencies that would prevent adequate access to equipment and components installed or missing that would prevent the TAB Services from being carried out successfully.

C. TAB Firm Services:

1. TAB personnel shall, upon completion of the installation and start-up of the mechanical equipment systems, test, adjust and balance the HVAC systems to provide optimum temperature, airflow and noise conditions in the conditioned spaces in the building while the HVAC equipment is operating efficiently.
2. The Firm shall be responsible for testing, adjusting, balancing and logging actual data on all air distribution and air moving equipment, fans, heating and cooling equipment and the operating conditions of all motors, etc. as indicated in this specification.

    a. Air Distribution Devices:

        1) Preset all volume dampers in the 100% open position.
        2) Determine and verify proper air pattern deflection devices have been installed.
        3) Verify size and types of all air devices installed, versus, the sizes and types indicated on the Drawings.
        4) Read out all air distribution devices served by their source (Constant Volume Rooftop Unit, A/C unit, Exhaust Fan, Make-up Air Fan, etc.)
        5) Balance all air distribution devices proportional to design CFM.
        6) Adjust source to design CFM.
        7) Verify that all air distribution devices are within plus or minus 10% of design (and all proportional to one another on each system).

    b. Supply/Exhaust Fans:

        1) Verify correct fan rotation.
        2) If belt driven, verify proper belt tension and that fan and motor sheaves are properly aligned.
        3) Verify that all safeties and interlocks are operational.
        4) Verify correct size and rating of motor overload protection.
        5) Verify fan motor is not overloaded; amperage readings do not exceed nameplate rating, for each phase, as applicable.
        6) Determine total air quantities of system served by the respective fan. Air quantities to be determined by duct traverse if duct configuration permits and air velocity is 1000 feet per minute or greater.

7) If air volume is less than design and motor capacity is available, adjust fan to design CFM. If new sheave or sheaves and belts are required, data will be submitted to Contractor.
8) Balance air distribution system (see Air Distribution Devices).

c. Rooftop Air Conditioning Units (RTU) or Split DX A/C Units (New and Existing in area of work):

1) Verify that the outside, return and relief air dampers are operational and move freely.
2) Verify that filters are clean at the time of testing.
3) Verify correct evaporator and return or relief air (as applicable) fan rotation.
4) If belt driven, verify proper belt tension and that fan and motor sheaves are properly aligned. If direct drive, verify that motor is a multi-speed motor and adjust speed setting for air balance purposes.
5) Verify that all RTU safeties are operational, as applicable, (low and high pressure limit switches, freezestat, high static pressure, anti-recycle timer, etc.).
6) Verify correct size and rating of motor overload protection for each fan motor.
7) Verify each fan motor is not overloaded; amperage readings do not exceed motor nameplate rating.
8) Determine total supply and return air. Air quantities to be determined by duct traverse if duct configuration permits and air velocity is 1000 feet per minute or greater.
9) Balance air distribution system (see Air Distribution Devices).
10) If air volume is less than design and motor capacity is available, adjust fan or fans, to obtain supply and return design CFM quantities to within + 10% of design. If new sheave or sheaves and belts are required, data will be submitted to Contractor for change out. For direct drive fans, adjust fan speed setting. After adjustments are made, retest units to determine final air balance quantities.
11) Verify all temperature control devices are set and calibrated at design set points.

d. Fire, Fire-Smoke, and Smoke Dampers:

1) Verify operation of all fire-smoke and smoke dampers only by witnessing the Contractor fully opening and closing these dampers.
2) Verify each fire, fire-smoke, and smoke damper is located where indicated on the Drawings and tagged or identified with a permanent fire resistant tag or stencil (at access door location).
3) Verify that each fire, fire-smoke, and smoke damper is provided with a suitably sized and located access door to allow full testing and observation of damper operation. Verify each duct access damper has suitable access through general construction features.
4) Witness the Contractor testing each fire-smoke and smoke damper which shall be manually released, allowed to fully close, verifying it has a tight fit when closed, and then verify it does not bind when opening or closing.
5) Witness each fire-smoke and smoke damper being fully opened by the Contractor and the fusible links on the fire damper portion of fire-smoke dampers being reset by the Contractor to include other related devices on smoke-fire dampers.
6) Verify that all fire dampers are fully opened.
7) Identify all dampers requiring repair or having a faulty installation.
8) Write down pertinent information on damper testing tags to verify dates tested and initials of tester to confirm a successful test was conducted.

e. Cooling and Heating Coils:

1) Verify that all coils are installed properly.
2) Verify that all cooling and heating coils have filters installed upstream of coils.
3) Verify no simultaneous cooling and heating occurs at any piece of equipment except during a humidity control sequence.
4) Verify correct overload devices are installed for electric heating devices.

5) Verify operation of all safety devices.
6) Record entering and leaving air dry bulb temperatures, as applicable, to determine actual air temperature drop or rise as compared to the design value for all equipment tested. Additionally, for cooling coils, record the entering and leaving wet bulb temperatures for each component.

3. During the balancing process, all abnormalities or malfunctions of equipment or components discovered by the TAB personnel, will be reported promptly to the Engineer, Owner and Contractor so that the condition can be corrected expediently.
4. The temperature controls will be verified for calibration and proper relationship between control devices. The Contractor will be advised of any instruments out of calibration so that the Automatic Temperature Controls (ATC) contractor can recalibrate, using data supplied by the TAB Firm as required.
5. Thoroughly test the Energy Management System (EMS), as applicable. The testing of the Energy Management System shall include all HVAC controls, sensors, operators, sequences, etc. The tests shall include verification that commands introduced at the EMS console actually occur and temperatures, pressures, etc. indicated at the EMS console correlate with the actual reading at the sensing point. The ATC and EMS contractor shall provide technical support to the TAB Firm for a complete check out of the HVAC temperature controls and the Energy Management System. The EMS workstation console and field direct digital control panel displays of measured variables such as temperature, relative humidity, carbon dioxide and pressure shall have the displayed values offset through software to be within 0.3 Deg.F. of the temperature, 5.0 percent for relative humidity, 25 parts per million (PPM) for carbon dioxide, and 0.01% for pressure of the actual variables measured in the field, with recently calibrated test equipment, at the sensor locations.
6. After testing, adjusting and balancing to the design conditions, if comfort conditions are not being maintained, the air conditioning system shall be rebalanced within the limitations of the equipment installed to obtain comfort conditions. If comfort conditions cannot be obtained, a report will be submitted giving specific data regarding the trouble area.
7. Make not less than three (3) inspections within ninety (90) days after occupancy of the building, and make adjustments if required, to insure that satisfactory conditions are being maintained throughout. Inspections are to be coordinated with Engineer, and Owner; and shall be documented with a supplemental report containing data and information, as required, after each visit, to document in writing that such visit took place and to note any unusual operating conditions.
8. Make an inspection during the opposite season from that in which the initial adjustments were made and at that time make any necessary modifications to the initial adjustments required to produce optimum operation of the systemic components to produce the proper conditions in each conditioned space. The opposite season inspection shall be coordinated with the Engineer and Owner. This inspection shall be documented with a supplemental report containing any pertinent data and information regarding readings and adjustments made.

1.5 TAB REPORT

A. TAB report shall incorporate all performance data for the HVAC systems. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operating personnel.

B. All measurements and recorded readings (of air, electricity, etc.) that appear in the report must be made on site by the permanently employed technicians or engineers of the TAB Firm.

C. TAB report shall include but not be limited to the following:

1. Index.
2. Preface: A general discussion of the system, an outline of normal and ventilation modes of operation, any unusual operating conditions and any deficiencies not corrected as of the time the report was written.
3. Instrumentation List: A list of instruments used by type, model, range and calibration date. All instruments must be calibrated within six (6) months prior to the starting date of TAB services.
4. Air Distribution Devices (Supply, Exhaust and Return Air type where Balance Dampers are used):
    a. Manufacturer, model and size.
    b. Location.

c. Design and actual CFM (cooling and heating).
d. Air distribution devices, where a velocity indicating instrument is used to determine CFM; provide the required and actual velocity in FPM (when an air flow hood is used to determine CFM, only CFM is required to be recorded.)

5. Supply/Exhaust Fans:

a. Manufacturer, model and size.
b. Design and actual CFM.
c. Design and actual fan RPM.
d. Design and actual static pressure (leaving minus entering).
e. Motor nameplate data.
f. Motor starter data and motor overload protection (heater) sizes and rating.
g. Actual motor amperage and voltage (all phases).

6. Rooftop Air Conditioning Units and Split DX A/C Units (New and Existing in area of work):

a. Manufacturer, model, size and serial number.
b. Design and actual CFM (Supply, Return and Outside Air).
c. Design and actual Evaporator Fan RPM.
d. Static air pressure entering and leaving filters, coils and evaporator fan.
e. Unit and evaporator motor nameplate data.
f. Evaporator fan motor starter data and motor overload protection heater sizes and rating.
g. Actual motor amperage and voltage (all phases).
h. Filters; type, thickness, sizes, quantities of each size, actual static pressure drop across filters and condition (new, clean, dirty, loaded, etc.).
i. For belt driven fan motors, provide fan and motor shaft diameters, sheave model and serial numbers, number and size of belt(s), and center to center distance of shafts.
j. Ambient air temperature at RTU during testing and condenser coil discharge air temperature, Deg. F.
k. Design and actual entering and leaving air temperatures through both the heating section and cooling coils; include wet bulb temperatures for cooling coils.

7. Coils:

a. Manufacturer.
b. Design and actual CFM.
c. Design and actual entering and leaving static pressures.
d. Design and actual entering air dry bulb temperatures. Provide design and actual entering air wet bulb temperatures for each cooling coil and latent energy recovery component.
e. Design and actual leaving air dry bulb temperatures. Provide design and actual leaving air wet bulb temperatures for each cooling coil and latent energy recovery component.
f. Actual outside air temperature, dry and wet bulb, during testing.

8. Fire, Fire-Smoke, and Smoke Dampers:

a. Fill out a tag (provided by the Contractor) at each damper with a set of the tester's initials and the date that the damper was tested and operation verified, as witnessed by the TAB firm, as being acceptable.
b. Tags shall have additional spaces for future testing/verification.

9. Condensing Units:

a. Manufacturer, Model, Size, and Serial Number.
b. Location.
c. Actual unit name plate data.
d. Actual unit (compressor and condenser unit motors) amperage and voltage, all phases.
e. Ambient temperature entering condenser.

D. Instructions to Operating Personnel: TAB Firm shall instruct the operating personnel regarding the following:

1. Systems Operation.
2. Unusual Operating Conditions
3. System Troubleshooting Procedures.

E. Guarantee: Provide extended warranty of twelve (12) months after occupancy during which time the Engineer and/or Owner may, at his discretion, request check of the balance of any HVAC equipment. Provide TAB technicians to assist as required in making such tests. When any device is found not balanced in accordance with the mechanical plans and specifications, that HVAC system shall be completely rebalanced as directed by the Engineer and/or Owner at the TAB Firm's expense.

END OF SECTION

SECTION 23 07 00

INSULATION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

A. Provide the systems of insulation which are specified for the control of heat transfer, sound control, and prevention of condensation.

B. Provide protective devices to prevent compression abrasion or puncture of the piping insulation systems installed to include inserts, pipe shields, PVC jacketing and aluminum jacketing as specified herein.

C. Provide piping identification systems as specified in Section 23 05 53, Identification for Equipment and Piping.

1.3 QUALITY ASSURANCE

A. The installation of all thermal insulation shall be performed by a single firm regularly engaged in the insulation business, using skilled insulation mechanics and using insulation materials which are the product of reputable manufacturers. The application of the materials by the insulator shall be in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.

B. Materials shall be manufactured by Schuller, Pittsburg Plate Glass, Owens-Corning, Foster, Certainteed, Johns Mansville, or Knauf.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions to allow review of Materials and Methods to ensure complete compliance with specifications.

B. Shop Drawings: Submit materials to be used and method of application for each system in tabular form. General statements not specifically identifying means or methods to be used shall be cause for rejection. Include descriptive data and cut sheets on each type of insulation material, sealing method, adhesives used, insert types, shield sizes, and PVC or aluminum jacketing as specified.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Promptly replace all damaged, deteriorated or wet insulation materials.

C. Storage and protection of materials shall be in accordance with Section 23 05 00.

PART 2 - PRODUCTS

2.1 PIPING AND EQUIPMENT INSULATION MATERIALS

A. Interior Domestic Cold Water Lines: Refer to Division 22.

B. Domestic Hot Water and Hot Water Return Lines: Refer to Division 22.

C. Waste, Drain and Miscellaneous Lines:

1. The drain from each Roof-Top Unit or Split DX A/C Unit shall be insulated with foamed plastic, Armacell Armaflex or Aeroflex Aerocell slipped on while the piping is being fabricated, and with all joints, butt type, sealed using an adhesive recommended by the manufacturer of the plastic. As an alternate to slipping on during fabrication, the Armacell Armaflex with lapseal may be used if insulation is installed after fabrication. The insulation shall be continuous from the drain opening in the D/X split system condensate pan to the point of discharge with an open sight air gap over a drain and all rooftop drains except for piping located on the roof. All formed plastic insulation shall meet ASTM E-84 requirements. Provide 1/ 2" thick insulation on condensate drains and 1-1/2 inch thick insulation on refrigerant suction piping. For all “Armaflex” type insulation installed outdoors apply two (2) coats of NOMACO K-Flex R-374, or Foster 30-64, or approved equal, protective coating (ultra-violet rays), white in color.
2. The body of each floor drain and all primary and overflow roof drain bodies, where the body of the drain is out of the ground, or above a ceiling: Refer to Division 22.
3. Waste lines serving electric water coolers and floor drains (includes P-traps) receiving cold condensate from air handling equipment condensate pans to the point where they join the nearest vertical waste stack or sanitary main, all horizontal and vertical primary storm drainage piping to the point of penetration to the underfloor and the first vertical piece of the overflow drain pipe (below the drain body) and the first horizontal section of overflow drain piping to the first three feet (3’) of vertical pipe beyond that section: Refer to Division 22.

D. Refrigerant Lines Exposed to the Outdoors:

1. Insulate as described in A.1 above.
2. Cover with an 0.016 inch thick aluminum with locked seams and banded joints made watertight. Jacketing shall be equivalent to Childers Aluminum roll jacketing conforming to ASTME B-209, with smooth mill finish.
3. Cover mechanical couplings and fittings with prefabricated aluminum jacketed fitting covers with factory applied moisture barriers to thickness to match that on piping and band in place. Fitting covers shall be equivalent to Childers ELL-JACS., Tee-Jacs, Flange-JACS, and Valve-JACS. Seal ends to prevent moisture penetration and to make completely weatherproof.

E. Plenum Safe Jacketing:

1. Where non-plenum rated piping (such as PVC, CPVC, FRP, PE, PP, ABS, PVDF, HDPE, etc.) is installed in return air plenums cover all exposed portions of this piping with a plenum safe jacketing, or wrap, system that is a factory manufactured and tested non-combustible barrier, to flame and smoke spread, designed to encapsulate non-rated or combustible items located in return air plenums, in accordance with the most recent additions of the International Building and Mechanical Codes.
2. Plenum safe jacketing shall be covered with a light weight fiberglass reinforced foil scrim finished high temperature rated insulation with an approximate density of 6 pounds per cubic foot. Jacketing shall have a Flame Spread and Smoke Developed rating of 0 for the unfaced blanket and be under 25 and 50 respectively for these items as tested in accordance with U.L. 723 and ASTM E-84. Maximum Flame Spread in accordance with U.L.1887 shall be 0 feet. Maximum smoke/optical density and Average Smoke per U.L.1887 testing shall not exceed 01 and 0 respectively. U.L. 1887 test procedure is a modified tunnel test which provides test data for flame spread and smoke density using a single plastic pipe and a bundle of plastic pipes of various sizes subjected to a fire test.
3. Thermal resistance of the barrier system shall be 4.2 as tested in accordance with ASTM C518. The Barrier System shall be able to withstand an operating temperature up to 2,300 Deg.F. and have a melting point of no lower than 3,100 Deg.F.

4. Plenum safe jacketing shall be a minimum 1/2 inch thick and have at least one side covered with a foil skin which must face the outer, or exposed, side. All joints in each direction shall be overlapped a minimum of one inch (1"). Jacket shall be secured tightly around the piping with either stainless steel banding or stainless steel tie wire. Use stainless steel crimp clamps on banding fasteners. Tie wires shall be secured using twist tensioning. Seal all cut edges with aluminum foil tape to ensure there is no exposed fiber.
5. Plenum safe jacketing shall be as manufactured by:
    a. Great Lakes Textiles, Inc. or approved equals by;
    b. 3M Corporation.
    c. Thermal Ceramics.
    d. FryeWrap by Unifrax.

2.2 DUCTWORK INSULATION MATERIALS

A. Duct Insulation - External:

1. Concealed (above ceilings) external duct insulation shall be glass fiber blanket-type insulation of not less than 1 lb. per cu.ft. density with a factory applied flame-retardant vapor barrier facing. Facing shall consist of a layer of aluminum foil, reinforced layer of glass fibers, and a layer of kraft paper all bonded together with fire-retardant and adhesive. Insulation, adhesives, and tapes shall be rated in accordance with U.L. 181A or 181B. Minimum ductwrap insulation thickness shall be two inches (2") thick and be equal to Certainteed Type IV duct wrap.
2. All insulation systems shall meet the requirements of the 2015 version of the International Energy Conservation Code, which requires a minimum installed R-value of 6.0 for conditioned, cooled or heated, and outside air system ductwork and plenums when located inside buildings or spaces. Increase insulation thicknesses as required to comply.
3. Water Vapor Permeance shall be no greater than 0.05 Perms per ASTM-E-96.
4. Fire Hazard Classification of installed duct insulation systems shall meet the requirements of ASTM-E-84; Flame Spread of 25, or less; Smoke Developed and Fuel Contributed of 50, or less. All insulation systems, adhesives, mastics, sealants, and tapes shall be U.L. rated for the application. All tapes used shall be acrylic based.
5. All external duct insulation shall be a regularly manufactured product of one of the following:
    a. Knauf.
    b. Owens Corning.
    c. Johns Manville.
    d. Certainteed.

B. Duct Insulation - Internal:

1. Internal duct insulation, liner, shall be in thicknesses as indicated herein, and be as specified in Specification Section 23 30 00. Duct liner shall be one inch (1") thick on all return, transfer, and relief air ducts, and on portions of general exhaust air ductwork systems as specified elsewhere herein. Internal duct insulation on all conditioned, cooled or heated, supply, all outside air ductwork systems and all mixed air plenums shall be 1-1/2" thick duct liner.
2. All duct liner shall be made of glass fiber coated with a bonded mat on the air stream side of the insulation. Coating shall be neoprene based meeting the requirements of NFPA-90A and U.L. Standard 723. Insulation shall not be less than 1.5 lbs. per cu.ft. density, and have a K-value of 0.28 per ASTM-C-177 at a mean temperature of 75 Deg.F.
3. All insulation systems shall meet the requirements of the 2015 version of the International Energy Conservation Code, which requires a minimum installed R-value of 6.0 for conditioned, cooled or heated, supply and all outside air system ductwork and mixed air plenums when located inside buildings or spaces. Increase insulation thickness as required to comply.
4. Fire Hazard Classification of installed duct insulation systems shall meet the requirements of ASTM-E-84; Flame Spread of 25, or less; Smoke Developed and Fuel Contributed of 50, or less.
5. All insulation systems, adhesives, mastics, sealants, and tapes shall be U.L. rated for the application.
6. All duct liner shall be suitable for the air velocities to be encountered in each system, and shall generally be suitable for velocities of up to 6000 FPM.

7. Acceptable duct lining manufacturers shall be:

   a. Certainteed.
   b. Knauf.
   c. Owens Corning.
   d. Johns Manville.

PART 3 - EXECUTION

3.1 GENERAL

A. Apply insulation and pipe covering after all of the piping system to be insulated has been pressure tested, found to be completely tight (without leaks), and accepted as such. All extended handles and caps should be installed prior to commencing with insulation. Verify that control, isolation, and balancing valves and any other piping specialty where a valve stem or test port extends beyond the normal pipe insulation thickness to be installed is installed pointed upward vertically. Thoroughly clean and dry all surfaces prior to being covered.

B. All insulation shall be continuous through wall and ceiling openings and sleeves. Use exterior duct wrap insulation on the outside of smoke and fire damper sleeves. Create a secondary sleeve around the primary sleeve to allow a complete insulation system as allowed by the local authority having jurisdiction.

C. All insulation and accessories shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

D. Unsightly work shall be cause for rejection, including poor application of adhesives and coatings beyond the insulation which coats valves or other piping specialties.

E. Damage or Modification to Insulation: Where new insulation is disturbed or damaged during the process of installing other new materials, making new connections, etc., it shall be repaired or replaced to return it to its original condition and appearance. Where lines are removed and connections to insulated lines are capped, insulate those caps as well as repairing damaged insulation. Materials shall match those presently installed in thickness, density, insulating value, jacketing, etc.

F. Miscellaneous Lines: Piping connected to chilled or hot water lines through which there might be fluid flow on occasions such as the lines connected to air vents, lines running to compression tanks, etc. shall be insulated as described for other piping in those systems.

G. Hanger and Support Locations: At the location of hangers or supports for pipes run above ground and finished with a vapor seal insulation, provide rigid sections of cork, Foamglas, calcium silicate or high density polyurethane, at least the same thickness as the adjacent insulating material to adequately support the pipe without compression of the insulating material and cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the lines. Where the insert has an insulating value less than the adjacent pipe insulation the thickness of the insert shall be increased to equal the insulating value of the adjacent pipe insulation. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall be installed exterior to the insulation.

H. Material Changes: Wherever there is a change in materials on lines that are vapor sealed, apply a suitable adhesive that is compatible with both materials, tapes, etc., as required to maintain the vapor barrier.

I. The following describes materials, thickness and finishes for insulation on piping. In the following "exposed" shall mean any line or duct exposed below the finished ceiling and structure where no ceiling is installed, in any room space, area, mechanical rooms, closets, and any line or duct run exterior to the building, including above the roof. "Concealed" shall mean any line or duct located above ceilings, in furrings, in chases, in crawl spaces, and buried in direct contact with the soil.

J. All insulation materials and jacketing shall exhibit the following characteristics:

1. Water sorption, per ASTM C 1104, shall be less than 0.02%.
2. Linear shrinkage, per ASTM C 356, shall be negligible.
3. Stress corrosion, per ASTM C 795, shall not cause corrosion.
4. Corrosiveness, per ASTM C 665, shall not be any greater than sterile cotton.
5. Resistance to fungi, mold and mildew and bacteria, per ASTM C 665, shall be rated as not promoting growth of fungi and bacteria. Inhibitors shall be added to specified products to meet these requirements.

3.2 DUCTWORK

A. Duct Insulation - Internal: Provide sound absorbing and thermal insulation to the interior surface of the following duct systems: Line the first 10 foot from the unit of all rectangular low pressure supply (except kitchen and fume hood make-up air ducts), return, relief, transfer, and outside air ducts and supply, mixed, and return air plenums, unless noted, otherwise on the drawings. Additionally, line the first 10 feet of general exhaust ducts, except grease, fume, exhaust systems, on both sides of in-line fans and for the first 10'-0" from the fan curb toward the occupied space for roof mounted fans. All lined ductwork shall be increased in size to maintain the clear inside (air stream) dimensions designated on the Drawings.

1. Duct liner shall be applied in accordance with the manufacturer's recommendations, with the coated, or mat-faced, surface located away from the metal (exposed to air stream). It shall be adhered to the metal with Foster 85-10 or 85-15 adhesive applied to the entire inner surface of the duct. The liner shall be further secured to the duct with Graham Insulating Pins and Clips or other metal clips of the type which do not protrude through the duct. Those clips shall be installed on not greater than 12" centers both ways. All seams and openings in the liner shall be carefully sealed with adhesive.
2. Paint all joints in liner and butter the edges of sections where sections of ductwork will be joined using Foster No. 30-35, or equivalent adhesive.
3. Where damper rods occur, suitable metal bushings shall be provided on each end of the damper rod inside the duct, to provide clearance between the damper blade and the lining.
4. Refer to Section 23 30 00, HVAC Air Distribution.
5. Due to the 2015 version of the International Energy Conservation Code, conditioned air, heated or cooled air (includes outside air intake ductwork), ductwork insulation located inside the building envelope shall have a minimum installed R-value of 6.0. For lined ductwork, this shall be accomplished by using 1-1/2" thick duct liner. Coordinate insulation requirements with other Sections of these Specifications.

B. Duct Insulation - External:

1. Externally insulate all rectangular and round supply and return air ducts not containing internal lining (Kitchen and fume hood make-up air ducts shall not contain internal lining and shall always be externally insulated).
2. Additionally insulate the outside of all fire, fire-smoke, and smoke damper sleeves penetrating walls and floors to insure a continuous insulation system.
3. External insulation shall be applied in accordance with the manufacturer's recommendations by impaling over pins using speed clips or be secured with adhesive.
4. Seal all joints, breaks, fastener penetrations and punctures with a 3" wide vapor barrier strip similar to that of facing materials secured with adhesive. Pins shall be spaced 12" on center both ways. Adhesive shall cover the entire duct surface.
5. Blanket type insulation shall generally be used on concealed ductwork only with rigid insulation board being used exclusively on exposed ductwork, which shall also receive a PVC jacket when located 12'-0", or less, above the finished floor.
6. Mastic seal all jacketing penetrations with a vapor barrier coating with a maximum perm rating of 0.02 Perms.

3.3 SHIELDS AND INSERTS

A. Metal saddles, shields, shall be applied between hangers or supports and the pipe insulation. Saddles shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for hanger inserts. Shields shall be made of galvanized sheet metal and shall be of sufficient size and length to prohibit the crushing of the insulation materials. Saddle shields shall be as follows:

Pipe Size	Metal Saddles	
	Metal Gauge	Length
3/4" to 3"	18	12"
4" to 6"	16	12" - 18"
8" to 10"	14	24"
12" & Larger	12	24"

END OF SECTION

SECTION 23 08 00

MECHANICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 DESCRIPTION

A. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
   1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
   2. Verify and document proper performance of equipment and systems.
   3. Verify that Systems and Operations and Maintenance (O&M) documentation is complete.
   4. Verify that the Owner's operating personnel are adequately trained in the O&M of these systems.

B. The systems to be commissioned include: rooftop units, split DX A/C units, electric unit heaters, condensing units, fans, and all related controls.

C. Commissioning requires the participation of Division 23 and 26 system installers to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 installers shall be familiar with all parts of the commissioning plan issued by the Commissioning Authority (C.A.) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

D. Commissioning Team members shall consist of the Commissioning Authority (C.A.), the designated representative of the Owner, the General Contractor (GC, CM or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the Testing, Adjusting, and Balancing (TAB) representative, the Controls Contractor (CC), and any other installing subcontractors or suppliers of equipment pertinent to the complete installation of Division 23 and 26 Systems intended to be Commissioned. The Owner's representative for operations and maintenance shall also be a member of the commissioning team.

1.3 COMMISSIONING AUTHORITY

A. The commissioning authority or agency shall be selected and employed by the building owner. The commissioning agent shall be a licensed professional engineer in the State where the work will be performed, and shall be experienced in the commissioning of mechanical and electrical systems of the type installed in this project. Experience in the construction process, direct digital control systems, Testing, Adjusting, and Balancing; and ASHRAE Guideline 1.1-2007 is mandatory. The commissioning agent shall not be associated with or employed by a mechanical contractor, or equipment supplier. Contractor shall include the allowance indicated in Division 1 Section 01 20 00 of the specifications for the commissioning services. **Commissioning Services shall be paid by an allowance in general contracting scope**. CMR shall select the commissioning authority at an early stage of the project and notify the Contractor of the C.A. that shall be employed.

1.4 COMMISSIONING PLAN

A. Commissioning Plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will provide the plan, which will continue to evolve and expand as the project progresses. The project *Specifications* shall take precedence over the *Commissioning Plan*.

B. Commissioning Process includes a narrative that provides a brief overview of the typical commissioning tasks during construction and the general order in which they will occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout the active construction phase, as scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the pertinent subcontractors in developing startup plans and startup documentation formats, including prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
6. The Subcontractors, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The Subcontractors develop proposed specific equipment and system functional performance test (FPT) procedures. The CA will review these procedures and develop the official FPT procedures to be incorporated into the project.
8. The procedures are executed by the Subcontractors, under the direction of, and documented by the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Subcontractor’s expense and the system is then retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is intended to be completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that it was completed.
13. Deferred testing is conducted, as specified or as required.

1.5 RESPONSIBILITIES

A. General Contractor (GC):

1. Facilitate the coordination of the commissioning work as outlined by the CA, and with the assistance of the CA, ensure that all commissioning activities are being scheduled into the master construction schedule.
2. Include all costs of commissioning, as outlined herein and elsewhere, in the total contract price.
3. Furnish one (1) copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to equipment to be commissioned to the CA.
4. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and complete training.
5. Ensure that all subcontractors execute their commissioning responsibilities according to the Contract Documents and schedule.
6. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
7. Coordinate the training to be provided to the Owner’s personnel.
8. Prepare O&M manuals and systems manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to “as-built” conditions.
9. Warranty Period:

a. Ensure that Subcontractors execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
b. Ensure that Subcontractors correct deficiencies and make necessary adjustments to O&M manuals and “as-built” drawings for applicable issues identified in any seasonal testing.

B. Mechanical and Controls Systems Installers:

1. Commissioning responsibilities applicable to each of the mechanical and controls (systems installers) of Division 23 are as follows (all references apply to commissioned equipment only):

a. Construction and Acceptance Phases:

1) Include the cost of commissioning in the contract price.
2) In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, Systems and O&M data and training.
3) Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
4) Contractors shall provide the CA with normal cut sheets and shop drawing submittals of all equipment to be commissioned.
5) Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.

a) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
b) The Commissioning Agent may request further documentation necessary for the commissioning process.

6) Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
7) Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8) Preparing proposed specific functional performance test procedures for submission to and consideration of the CA. The CA will use these submittals to prepare finalized test procedures. Subcontractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests, as applicable.
9) Develop a full start-up and initial checkout plan using manufacturer’s start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to startup.
10) During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
11) Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
12) Address current A/E punch list items before functional testing. Air TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air related systems.
13) Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the

agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

14) Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
15) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, and A/E and retest the equipment.
16) Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to “as-built” conditions.
17) Prepare redline “as-built” drawings for all drawings and final “as-builts” for contractor-generated coordination drawings.
18) Provide training of the Owner’s operating personnel as specified.
19) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

b. Warranty Period:

1) Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Mechanical (Systems Installer) Contractor:

1. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

a. Provide startup for all HVAC equipment, except for the building automation control system.
b. Assist and cooperate with the TAB contractor and CA by:

1) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
2) Including cost of sheaves and belts that may be required by TAB.
3) Providing temperature and pressure taps in piping and equipment according to the Construction Documents for TAB and commissioning testing. Verify locations for taps with the CA before installation.

c. Prepare a schedule for Division 23 equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
d. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

D. Controls (Systems Installer) Contractor (CC):

1. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:

a. Sequences of Operation Submittals. The Controls Contractor’s submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

1) An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
2) All interactions and interlocks with other systems.
3) Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.

4) Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
5) Start-up sequences.
6) Warm-up mode sequences.
7) Normal operating mode sequences.
8) Unoccupied mode sequences.
9) Shutdown sequences.
10) Capacity control sequences and equipment staging.
11) Temperature and pressure control: setbacks, setups, resets, etc.
12) Detailed sequences for all control strategies, e.g., optimum start/stop, staging, optimization, demand limiting, etc.
13) Effects of power or equipment failure with all standby component functions.
14) Sequences for all alarms and emergency shut downs.
15) Seasonal operational differences and recommendations.
16) Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
17) All sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

b. Control Drawings Submittals shall include:

1) Control drawings shall have a key to all abbreviations.
2) Control drawings shall contain graphic schematic depictions of each system and each component.
3) Schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4) Provide a full points list with at least the following included for each point:

a) Controlled system.
b) Point abbreviation.
c) Point description.
d) Display unit.
e) Control point or setpoint (Yes / No).
f) Monitoring point (Yes / No).
g) Intermediate point (Yes / No).
h) Calculated point (Yes / No).
i) Key:

(1) Point Description: DB temp, airflow, etc.
(2) Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)
(3) Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
(4) Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
(5) Calculated Point: "Virtual" point generated from calculations of other point values.

5) Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

c. An updated “as-built” version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.
d. Assist and cooperate with the TAB contractor in the following manner:
    1) Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
    2) Have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
    3) Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
e. Assist and cooperate with the CA in the following manner:
    1) Execute the functional testing of the controls system as specified for the controls contractor.
    2) Assist in the functional testing of all equipment specified.
f. Controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing, according to the process. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
    1) System name.
    2) List of devices.
    3) Step-by-step procedures for testing each controller after installation, including:
        a) Process of verifying proper hardware and wiring installation.
        b) Process of downloading programs to local controllers and verifying that they are addressed correctly.
        c) Process of performing operational checks of each controlled component.
        d) Plan and process for calibrating valve and damper actuators and all sensors.
        e) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
    4) A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has “passed” and is operating within the contract parameters.
    5) A description of the instrumentation required for testing.
    6) Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.
g. Provide a signed and dated certification to the CA and CM or GC upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
h. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified.
i. List and clearly identify on the “as-built” duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

E. TAB Contractor. The duties of the TAB contractor, in addition to those listed above are:

1. Submit the outline of the TAB plan and approach for each system and component to the CA prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
2. Submitted plan will include:
    a. Reviewed the construction documents and the systems to sufficiently understand the design intent for each system.
    b. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    c. Detailed step-by-step procedures for TAB work for each system and issue.
    d. Plan for formal deficiency reports (scope, frequency and distribution) and final report.
3. Submit reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA as required.
4. Communicate to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB, which affect the control system setup and operation.
5. Provide a draft TAB report to the CA. The report should follow the latest reporting recommendations by AABC.
6. Provide the CA with any requested data, gathered, but not shown on the draft reports.
7. Provide final TAB reports in the number required.

F. Equipment Suppliers:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CA.
4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

G. Commissioning Agent (CA):

1. The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance items or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance so that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. Contractor and all subcontractors shall provide all tools or the use of tools to start, checkout and functionally test equipment and systems, to include any specified or required testing equipment needed to conduct these tests.
2. Construction Phase:
    a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
    b. Coordinate the commissioning work and, with the GC, ensure that commissioning activities are being scheduled into the master schedule.
    c. Revise, as necessary, *Commissioning Plan—Construction Phase.*
    d. Plan and conduct a commissioning scoping meeting.
    e. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
    f. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

g. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, along with A/E reviews.
h. Assist in the development of prefunctional tests and checklists.
i. Assist in the development of an enhanced start-up and initial systems checkout plan with Subcontractors.
j. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
k. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
l. Witness all or part of any ductwork testing and cleaning procedures, if required, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
m. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot-checking.
n. Approve systems startup by reviewing start-up reports and by selected site observation.
o. With necessary assistance and review from installing contractors, review the functional performance test procedures for equipment and systems. This may include energy management control system trending, or manual functional testing.
p. Analyze any functional performance trend logs and monitoring data to verify performance.
q. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
r. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
s. Oversee and approve the training of the Owner's operating personnel.
t. Compile and maintain a commissioning record and building systems book(s).
u. Review and approve the preparation of the O&M and Systems manuals.
v. Provide a final commissioning report.

3. Warranty Period:

a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
b. Return to the site at 10 months into the 12-month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

1.6 SCHEDULING

A. The CA will work with the GC according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the CM and GC for scheduling commissioning activities.

B. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the applicable Division 23 or 26 contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by the TAB firm in their commissioning responsibilities.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the Base Bid price of the Contractor and be left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in 23 05 93. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year and a resolution of + or - 0.5°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed to the test equipment or certificates of calibration shall be readily available with a copy being furnished to the C.A. for their records.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 90 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the GC. Information gathered from this meeting will allow the CA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings will be planned and conducted by the CA as required as the construction phase progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subcontractors. The CA will plan these meetings and will minimize unnecessary time being spent by Subcontractors, or any other member of the Commissioning Team.

3.2 REPORTING

A. CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

B. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

C. A final summary report by the CA will be provided focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will be part of the final report, and the entire report will be included in the O&M manuals.

3.3 SUBMITTALS

A. CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal

submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. Commissioning Agent will be given the opportunity to review all pertinent submittals related to equipment or systems to be commissioned for conformance to the Contract Documents, and more specifically as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning Agent will notify the appropriate persons as requested, of items missing or areas that are not in conformance with Contract Documents as it relates to the commissioning process, and which require resubmission.

C. CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. Submittals sent to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, although the CA will review them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned. Some systems that are not comprised so much of actual dynamic machinery may have very simplified PCs and startup.

B. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plans will be required by the CA who shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements.

1. Checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form may have more than one trade responsible for its execution.
3. Each Subcontractor responsible for the purchase of each item of equipment shall develop the full start-up plan for that equipment by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:

    a. Prefunctional checklists developed jointly by the CA and the subcontractors.
    b. Manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

c. Manufacturer's normally used field checkout sheets.

4. Each Subcontractor shall submit the full startup plan for which they are responsible to the CA for review and approval.
5. CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. Full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.

D. Sensor Calibration of all sensors shall be included as part of the prefunctional checklists performed by the Contractors, according to the following procedures:

1. Sensors Without Transmitters, Standard Application type, shall include taking readings with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensor	Required Tolerance (+/-)		Sensor	Required Tolerance (+/-)
Unit wet bulb or dew point	1.0 Deg.F.		Flow rates, air	10%of design
Indoor and outdoor air pressure differential	0.05 Inches W.G.		Pressures, air	5% of design
Outside air, space air, coil air temps	1.0 Deg.F.		Watt-hour, voltage & amperage	2%

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subcontractors and pertinent vendors shall schedule startup and checkout with the GC and CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved).
3. For lower-level components of equipment, (e.g., fans, sensors, controllers), the CA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. Subcontractors and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for supervisors to fill out these forms if they have not witnessed the test.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup:

1. Subcontractors shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. CA reviews the report and submits either a non-compliance report or an approval form to the Sub or GC. The CA shall work with the Subcontractors and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the GC and others as necessary. The installing Subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system using a standard form.

3.5 FUNCTIONAL TESTING

A. This sub-section applies to all commissioning functional testing for all Divisions.

B. Objectives and Scope of functional testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, no flow, equipment failure, etc. shall also be tested.

C. Development of Written Test Procedures shall begin with the CA obtaining all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall then, with the assistance the contractor, develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Subcontractor or vendor responsible to execute a test, shall provide assistance to the CA in developing the procedures (answering questions about equipment, operation, sequences, etc.). Prior to execution, Subcontractors shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

D. Test Methods shall include the following:

1. Functional testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Altering Set points rather than overwriting sensor values, and when simulating conditions is difficult, altering set points to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
4. Setup of each function and testing shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

E. Coordination and Scheduling by the Subcontractors shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the GC and affected Subcontractors. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subcontractors shall execute all tests. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation by the CA shall include witnessing and documenting the results of all functional tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the GC for review. CA will include the filled out forms in the Commissioning Report.

B. Non-Conformance.

1. CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
    a. When there is no dispute on the deficiency and the Subcontractor accepts responsibility to correct it:
        1) CA documents the deficiency and the subcontractor response and intentions and they go on to another test or sequence
    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1) The deficiency shall be documented on the non-compliance form with the Subcontractor's response and a copy given to the GC and to the Subcontractor representative assumed to be responsible.
        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
        3) The CA documents the resolution process.
        4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.
5. Cost of Retesting for the Subcontractor to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
6. Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. CA retains the original non-conformance forms until the end of the project.

C. Approval by the CA shall include notation of each satisfactorily demonstrated function on the test form. CA recommends acceptance of each test using a standard form. The Owner gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.7 SYSTEMS and OPERATION AND MAINTENANCE (O&M) MANUALS

A. Following System and O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals, according to this section, prior to the training of owner personnel.

C. CA shall receive a copy of the Systems/O&M manuals for review.

D. Special Control System O&M Manual Requirements shall include, in addition to documentation that may be specified elsewhere, the controls contractor compiling and organizing, at minimum, the following data on the control system in labeled 3-ring binders with indexed tabs:

1. Three (3) copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:
    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included if required in the controls specification section.
    b. Full as-built set of control drawings.
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list. In addition to the updated points list required in the original submittal.
    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Full as-built print out of software program as required.
    g. Electronic copy on disk of the entire program for this facility if required.
    h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
    i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
    j. Control equipment component submittals, parts lists, etc.
    k. Warranty requirements.
    l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
3. Manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller / module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).
4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Review and Approval of the commissioning related sections of the Systems and O&M manuals shall be made by the A/E and the CA.

3.8 TRAINING OF OWNER PERSONNEL

A. GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

C. Mechanical Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, heat rejection equipment, air conditioning units, air handling units, fans, controls and water treatment systems, etc.

3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. Controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. Training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:
    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written Systems/O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. The format and training agenda in *The HVAC Commissioning Process, ASHRAE Guideline* 1.1-2007 is recommended.
    i. Classroom sessions shall include the use of overhead projections, slides, and video/audio-taped material as might be appropriate.
9. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
10. Mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
11. Duration of Training by the mechanical contractor shall include providing training of sufficient length on each piece of equipment according to the requirements of the preceding specification sections. If not listed in the equipment sections, the following schedule shall be used.

Hours	System
2	Rooftop Units
1	Exhaust Fans
1	Split DX A/C Units

D. Controls Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four weeks before the planned training.
2. Controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.
3. Training manuals shall include the standard operating manual for the system and any special training manuals which shall be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a

definitions section that fully describes all relevant words used in the manuals *and* in all software displays. Copies of audiovisuals shall be delivered to the Owner.

4. Training will be tailored to the needs and skill-level of the trainees.
5. Trainers will be knowledgeable on the system and its use in buildings. The Owner shall approve the instructor prior to scheduling the training.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
7. Controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. There shall be three training sessions:

    a. Training I - Control System: The first training shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
    b. Training II - Building Systems: The second session shall be held on-site for a period of __4_ hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

        1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
        2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
        3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
        4) Every screen shall be completely discussed, allowing time for questions.
        5) Use of keypad or plug-in laptop computer at the zone level.
        6) Use of remote access to the system via phone lines or networks if included.
        7) Setting up and changing an air terminal unit controller.

    c. Training III - General Overview: The third training will be conducted on-site six months after occupancy and consist of _4_ hours of training. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

E. TAB contractor shall have the following training responsibilities:

1. TAB shall meet for 2 hours with facility staff after completion of TAB and instruct them on the following:

    a. Go over the final TAB report, explaining the layout and meanings of each data type.
    b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
    c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
    d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
    e. Other salient information that may be useful for facility operations, relative to TAB.

3.9 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan described and the filled out start-up, initial checkout, pre-functional, and functional checklists, training plans and records of training. These work products will be supplied to the CA to be included in the final commissioning report.

END OF SECTION

SECTION 23 09 00

CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with Section 23 00 00 General Provisions, and all other Division 23 Sections, as applicable.

C. Refer to other divisions for coordination of work with other trades.

1.2 SYSTEM DESCRIPTION

A. The scope shall include the furnishing and installing of Energy Management System devices with new direct digital controllers, all local and remote control panels, temperature control field devices, appurtenances, etc., to accomplish specific control sequences specified herein, to provide fire and freeze protection; cocks and wells for various temperature and pressure control, sensing and indicating devices; pressure and temperature indicating instruments; supporting structures, and other required components for a complete and operating system.

B. The scope shall include all new electric connections to new thermostats, sensors, valves, dampers and actuators, switches and relays, and all other new components of the system requiring electric connections.

C. The scope shall further include all temperature control and interlocking wiring and wiring devices, including raceways, as indicated herein.

D. Provide all software programs as required to effect the sequences of control, monitoring, reporting, etc., as indicated herein.

E. The new system installed shall be fully automatic, subject to various types of remote surveillance, routine remote adjustments, remote status, remote alarms, remote data collection for trending/historical files, and other operations as indicated herein, from a new local remote microprocessor-based Local Area Network (LAN), with the local system capable of stand-alone operation. The system shall be capable of being monitored and controlled remotely on site and off site by a Central Work Station located at the Facilities Central Maintenance office in the OPS Center via Owner's WAN, or Ethernet LAN, where such exists and is allowed thereby. The entire system of control and automation at this building shall thus become an integral part of the existing facilities Energy Management System (EMS).

F. Bidders are specifically advised that full and effective two-way communication between the new system installed under this contract and the Owner's existing Central EMS must be achieved in an approved manner, including whatever may be required in the form of interface hardware and software without effecting or interrupting other system software. Simultaneous on-line communication of this system and others with the Central EMS is mandatory.

G. This system of equipment and software shall be provided and installed by the single local factory trained and authorized sales, installation and service agent of TAC/Schneider Electric (Capable of servicing legacy TAC Vista systems).

1.3 QUALITY ASSURANCE

A. The equipment provided under this Section of the Specifications shall be installed, calibrated, adjusted, and put in completely satisfactory operation by a Control Systems installer experienced in this type of work.

B. The successful Control Systems installer shall meet the following requirements:

1. All spare parts must be locally stocked and readily available within a 24 hour period.
2. Service personnel shall be available, on call, on a 24 hour a day, year round basis, or service personnel will respond by visitation to the site within four (4) hours of a service call considered serious in nature or classified by the Owner as an emergency.
3. Be able to provide evidence of having successfully installed similar sized and types of systems for a minimum of ten (10) years.
4. Bids by wholesalers, distributors, mechanical contractors and non-franchised contractors shall not be acceptable.
5. All work described in the Plans and Specifications shall be installed, wired, and commissioned by factory certified technicians qualified for this work and in the regular employment of the control system manufacturer's local office.
6. A local office is defined as a corporate branch office or an independently owned office with a current contractual agreement with the system manufacturer that allows the office to purchase, install, and service the manufacturer's products.
7. The local office shall be full service facility within 50 miles of the project site. The local office shall be staffed with engineers and technicians trained on the installation, commissioning, and service of energy management and control systems based on the LonWork technology.

C. All control devices shall be as specified in the technical portion of this section of the specifications. The system shall be installed by workmen skilled, experienced, and specifically trained in the application, installation, calibration, adjusting, and testing of instrumentation of the type specified.

D. All control system components shall operate satisfactory without damage at 110% above and 85% below rated voltage and at ± 3 hertz variation in line frequency. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interference. All bus connected devices shall be A.C. coupled, or equivalent, so that any single device failure will not disrupt or halt bus communications. Provide line voltage input protection to all network level controllers to protect these devices from over-voltage and lightning strike conditions.

E. A service representative of the installer shall check the instrumentation for proper installation, calibrate all instruments and make all adjustments necessary to insure proper operation of the system in full cooperation with the Testing, Adjusting, and Balancing (TAB) Firm. Refer to Section 23 05 93. All instruments required for checking, calibrating, and proving the system shall be provided under this Section of the Specifications. The service representative shall spend sufficient time with all of the Owner's Representatives after the system is installed and properly functioning to instruct the Owner's Representative (Operations and Maintenance Personnel) in the operation and maintenance of the system for a minimum of two (2) hours for the basic Controls System and two (2) hours for the EMS. At final completion of the installation provide personnel and instruments of satisfactory quality available to check the calibration of all instruments, and to demonstrate system operation as described in "Sequences of Operation".

F. All basic control devices, parts, and other materials, shall be standard catalog products of a single reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year. All materials and parts shall be items in current production by the manufacturers. First of a kind new technology devices will not be considered. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic control equipment shall carry the guarantee of the basic control equipment manufacturer and repair and replacement parts shall be available through normal local trade channels.

G. All software updates and enhancements which evolve during the first year warranty period following system acceptance, "Substantial Completion", shall be furnished to the Owner without additional cost. This shall include the local stand-alone direct digital controllers and the building network manager computer(s).

H. All network level controllers shall be “LON Mark” and shall communicate with all other LON Mark Protocol communication systems at the building network level or be provided with a gateway which shall facilitate the building network level controller communicating with one of this system.

1.4 SYSTEM START-UP AND COMMISSIONING

A. After completion of the installation, Contractor shall place the system in operation and shall perform all necessary testing and debugging operations of the basic systems and EMS.

B. An acceptance test shall be performed in the presence of the Testing, Adjusting, and Balancing (TAB) Company, to verify correct sequences of operation, calibration, and operation of the Controls and Energy Management System, when installed, with every part of the system functioning satisfactorily and having been fully commissioned, and with no outstanding items requiring completion or correction, the system will be accepted by the Architect and Owner for "Substantial Completion", and will then be placed under Warranty.

C. The Automatic Temperature Control and Energy Management System Installer shall thoroughly check all controls, sensors, operators, sequences, etc., before notifying the TAB Agency that the Automatic Temperature Controls and Energy Management System are operational. The Automatic Temperature Control and Energy Management System Installer shall provide technical support (technicians and necessary hardware and software) to the TAB Agency to allow for a complete check-out of these systems.

1.5 SUBMITTALS

A. Submittals shall be complete and be in full accordance with Section 23 00 00, General Provisions.

B. Submittals shall include complete, continuous line, point to point wiring diagrams including tie-in points to equipment with written sequences of control adjacent to pertinent control diagrams. Specification sheets shall be submitted on each piece or type of equipment in a separate brochure and show sufficient detail to indicate compliance with these specifications. Drawings and Specification sheets shall show set points, throttling ranges, actions, proportional bands, and integration constants, where applicable. Complete brochures shall include the wiring diagrams as well as operating and maintenance instructions on the equipment.

C. Complete and approved shop drawings shall be obtained prior to commencing installation work, unless otherwise approved by the Owner or Owner's Representative.

D. Tag numbers, as shown or specified, shall appear for each item on the wiring diagrams and data sheets. Data sheets shall properly reflect in every detail the specific item submitted.

E. After completion of the work, Contractor shall prepare and furnish maintenance brochures for the Owner. The maintenance brochures shall include operating instructions, specifications, and instruction sheets for all instruments and a complete set of "As-Built" control drawings. After approval of submittal, completion of all installation work, software checkout, and system commissioning in conjunction with the Testing, Adjustment and Balance (TAB) Firm, furnish to the Owner the following:

1. One (1) sets of Blue or Black line prints of "As-Built" drawings, half size (11" X 17"), inserted in a three ring binder.
2. One (1) copies of the final approved Shop Drawings in suitably sized three ring binders. This shall include copies of product data sheets and other operations and maintenance documentation.

3. A complete replacement spare parts list.
4. A back-up copy of the EMS settings and sequences of operation on a compact disc (CD). The CD shall include all of the files necessary to restore the EMS and controls systems to normal operation in the event of a system failure.
5. Two (2) labeled C.D.'s with all the information indicated above for items 1, 2 and 3 in PDF format.

1.6 EMS SOFTWARE TOOLS AND LICENSES

A. Submit a copy of all software installed on the servers and workstations related to this project.

B. Submit all licensing information for all software installed on the servers and workstations.

C. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.

D. Submit all licensing information for all of the software used to execute the project.

E. All software revisions shall be as installed at the time of system acceptance.

1.7 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored, and which is damaged or defaced during construction shall be rejected.

B. Cover control panels, open ends of control piping and open ends of control valves stored on site until just prior to installation of wiring and valves respectively.

C. Storage and protection of materials shall be in accordance with Division 1.

1.8 CODE COMPLIANCE

A. All electrical components shall be UL listed or labeled.

B. All equipment or piping used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

C. All wiring shall conform to the National Electrical Code.

D. Provide BAS components and ancillary equipment which are UL-listed and labeled.

E. Provide enclosures and controls which comply with NEMA's Publication No. 250.

F. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.

G. Comply with FCC, Part 68 rules for telephone modems and data sets.

PART 2 - PRODUCTS

2.1 TEMPERATURE SENSORS

A. Temperature sensors shall be nickel wire thermistor, 10,000 ohm resistance, with 1000 ohms resistance at 70 Deg.F., and a 3 ohms/per degree F temperature coefficient. Sensors shall operate in a stable manner in a 5-95% relative humidity, non-condensing environment.

B. Ambient temperature limits shall be minimum of 0-125 Deg.F. with a +/- 0.5% accuracy at a nominal resistance equal to 70 Deg.F.

C. Temperature sensors and cabling used for temperatures below 60 Deg.F. shall be hermetically sealed to prevent condensation damage to conductors or elements. Sensors for immersion locations shall not be affected by vibrations encountered in normal piping systems.

D. Mixed air temperature sensors shall be the averaging capillary type to sense duct temperature across the full duct width. Minimum sensor length shall be 15 feet and include adequate supports for element within the duct or at the face of the coil, maintain minimum one inch (1") separation from coil.

E. Furnish sensors with maximum 6 to 9 inch insulated pigtail leads or trim sensor pigtail leads to meet this criteria once installed.

F. All sensor actions shall be the same for the entire building.

G. Mount all room wall sensors at 48" inches above finished floor to comply with A.D.A., unless indicated or approved otherwise by the Architect or Owner's Representative.

H. Wall space temperature sensors for normally occupied spaces shall include the following accessories, features and functions:

1. Normal Increase/Decrease Temperature Setpoint adjustments; limits set through software.
2. Impact Resistant Lexan type cover material.

I. Wall space temperature sensors in Common Public Areas (Corridors, Lobbies, etc.) or high abuse areas (Gyms, Locker Rooms, etc.) shall include the following accessories, features and functions:

1. Stainless steel cover plates with temperature sensor on back of cover plate.

J. Sensors shall be as manufactured by TAC/Schneider Electric; or Automation Components, Inc. (ACI).

2.2 RELATIVE HUMIDITY SENSORS

A. Provide a 100% solid state copolymer wafer, of bonded layer hygrometric materials, humidity sensor and transducer. Sensor shall require no periodic maintenance or recurring calibration. Sensor shall be linear and temperature compensated.

B. Sensor shall have +/-2% Relative Humidity (RH) accuracy over a 100% RH range and +/-1% over the 30-80% RH range.

C. Sensor shall produce outputs of 4-20 ma or 1-11 vdc.

D. Sensor shall be in an impact resistant cover with ventilating openings in occupied spaces. Provide duct or remote mount probes as required for the application.

E. Wall mounted sensors shall be mounted 48 inches above finished floor to comply with A.D.A., unless indicated or otherwise approved by the Architect or Owner's Representative.

F. Sensors in high abuse areas (Gyms, Locker Rooms, etc.) shall be mounted to the back of a stainless steel cover plate with a minimum 1/2 inch opening port for sensing purposes.

G. Acceptable Manufacturers:

1. Vaisala (±2% to 3% acceptable).
2. General Eastern (±2% to 3% acceptable).
3. Johnson Controls, Inc.
4. Schneider Electric.
5. Automation Components, Inc. (ACI).
6. Veris Industries.

2.3 CARBON DIOXIDE SENSORS

A. Furnish and install “CarboCap” technology (Vaisala) or Single Beam, dual wavelength, Infrared type technology (Tel-Aire) carbon dioxide sensors where indicated and as specified elsewhere herein.

B. Sensors shall accurately sense carbon dioxide levels from 250-2000 Parts Per Million (PPM) with an accuracy of ± 60 ppm (± 2% of range (2000 PPM) and ± 2% of reading (use 1000 PPM)), repeatability of ± 2% of full scale, maximum drift of ± 5% of full scale in five (5) years, ± 1% of full scale in six (6) months, and linearity of less than ± 3% of full scale.

C. Sensors shall be suitable for operation in environments of 60 Deg.F. to 104 Deg.F. and 15-95% relative humidity, non-condensing, and air velocity ranges of 200 to 2750 feet per minute when located in ductwork. Wall mount sensors shall be able to sense accurately with air velocities as low as 20 feet per minute.

D. Sensors shall be calibrated at the factory at 1,000 PPM, ± 50 PPM; at 72 Deg.F, ± 4 Deg.F.; and at 50% relative humidity, ± 5%.

E. Power requirements shall be 24 colts AC with a power consumption not to exceed 5 watts.

F. Wall mount sensors shall be mounted at 48-54 inches above the finished floor.

G. Sensors in high abuse areas (Gyms, Locker Rooms, etc.) shall be mounted on the back of a stainless steel cover plate with a minimum 1/2" opening port for sensing purposes.

H. Sensors shall be as manufactured by:

1. Vaisala, Model GMD/W20 or equals by;
2. Tel-Aire(Model 8101/8102), or
3. Alternate models by Veris Industries.

2.4 COMBINATIONS SENSORS

A. Where two (2) sensors, such as relative humidity or carbon dioxide, are located in the same location, a combination sensor shall be used. Combination sensors that include temperature are not acceptable. Temperature sensors shall be stand alone individual sensors.

B. Submit combination sensors for review and approval. Devices similar to the Veris Industries “CWL SHTA” are preferred and are acceptable.

2.5 CURRENT SENSING STATUS RELAYS

A. Provide current sensing status relays for motor operation status monitoring as specified elsewhere herein.

B. Sensors shall be 100% solid state, no mechanical parts, and have no calibration drift.

C. Sensors shall have an adjustable trip level, be isolated, have single set point adjustment, require no external power (power induced from conductor), and have integrated adjustable wall or floor mounting bracket.

D. Sensors shall be suitable for motor loads from 0 to 100 HP, with a supply current of 1 ampere up to 135 amperes, 600 VAC RMS, setpoint adjustable to +/-1% range from 0-95% non-condensing relative humidity

E. Sensors shall be as manufactured by Veris Industries, Inc.

F. Pilot relays on output for current sensor shall be RH2 BUAC 24V 2PDT (10 amp) or SH2B05 (7.5 amp) as manufactured by Idec.

2.6 SMOKE DETECTORS

A. One (1) smoke detector shall be furnished under Division 26 and installed by the Controls Contractor for each new air handling equipment item handling over 2,000 CFM of airflow; to be mounted in the return air stream, which shall stop the fan motors upon detection of smoke.

B. Coordinate with Division 26 requirements to insure sampling tubes are provided suitable to the width of duct in which installed.

C. Detectors shall be supplied with 24 volts, power supply under Division 26. Control circuit interlock wiring shall be installed by fire alarm contractor under Division 26. Controls Contractor to provide wiring to unit. Fire alarm Contractor to provide wiring to smoke detector or panel.

2.7 LOCAL CONTROL PANELS

A. New local equipment control panels shall be installed in each equipment room, or other locations as indicated or as required, for new electric control equipment and control devices. They shall be totally enclosed and pre-wired, to labeled terminals to house all associated controllers, thermometers, relays, switches, etc. serving that equipment. Provide one cabinet for each air handling unit or group of units in the same room.

B. Panels shall be mounted at a convenient height for access. Acceptable locations include mechanical equipment rooms, storage closets, electrical rooms, or other spaces as indicated on the Drawings. Above ceiling locations are typically not acceptable.

C. Thermometers, pilot light switches, and gauges shall be flush mounted on panel surface, where applicable.

D. Cabinet frames shall be extruded aluminum sections with riveted corners supported by internal angle brackets. Door shall have continuous hinged door, with latch and key lock.

E. Sub-Panel and face panel shall be removable for ease of installation and replacement. Face panel shall be of a finished color with a finished frame.

F. Knockouts for 1/2" x 3/4" EMT connections shall be provided at top and bottom of each panel.

G. Identify each panel, switch, and device by an engraved, bolt-on, black phenolic nameplate with white lettering securely attached. Identify all control devices inside panels similarly. Embossed plastic tape will not be acceptable on panel front faces but will be allowed on panel interiors.

H. Switches and pilot lights shall be mounted on the panel face with all other devices mounted inside the panel, as applicable. Devices wired through and inside panels, such as relays, shall be wired to numbered dual terminal strips.

I. Start-Stop Pushbuttons and Pilot Lights, where called for, shall be of the low voltage and neon type. Pushbuttons shall be heavy duty type. Pilot lights shall be interlocked with starter auxiliary contacts except fans and pumps which shall have current sensing relays to indicate run status.

J. Each new control panel installed shall have a minimum of 25% consolidated spare/extra space available inside the panel for mounting of control devices for future system modifications or changes. This space shall be indicated on the panel shop drawing.

K. All wiring inside panels shall be concealed in a wiring harness.

L. Permanently affix inside each panel a final "as-built" control drawing of the wiring of the panel.

M. All panels shall be factory assembled and wired and include a key cylinder lock. All locks shall use the same master key.

2.8 ENERGY MANAGEMENT SYSTEM

A. The central EMS HARDWARE is located in the District OPS Center Building and shall be reused. Reuse existing printers for recording alarms, operator transactions, and generating system reports, where applicable (120 character wide laser jet printer).

B. Network Automation Engine:

1. Provide a Network Automation Engine (NAE) which shall be a fully user-programmable supervisory controller. Automation Engine shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Automation engines.
2. The NAE shall reside on the automation network. Each NAE shall support one or more sub-networks of a minimum of 100 controllers each.
3. Each NAE shall have the ability to deliver a web based user interface. All computers connected physically or virtually to the automation network shall have access to the web based User Interface (U.I.). Systems without such capability at this level shall provide a user interface via the combination of operator workstations and web servers as determined by the owner for comparable operation.
4. Processor-controllers shall be multi-tasking, multi-user, and real-time digital control/processors. Standard operating systems shall be employed. Controller size and capacity shall be sufficient to fully meet the requirements of this Section of the Specifications.
5. Each controller shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
6. Each NAE controller shall have an integrated Hardware-Based, real time clock.
7. The NAE shall provide at least one USB port and one URS-232 serial data communication port for the operation of operator I/O devices, such as industry standard computers, modems, and portable operator's terminals. Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
8. Controllers shall continuously perform self-diagnostics, communication diagnostics, and diagnostics of all panel components. The automation engine shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failures to establish communication.
9. In the event of the loss of normal power, the NAE shall continue to operate for a user adjustable period of up to 10 minutes, after which, there shall be an orderly shutdown of all the programs to prevent the loss of database or operating system software. Flash memory shall be incorporated for all critical controller configuration data.
    a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions.
    b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
10. All NAE controllers shall be listed by Underwriters Laboratories (U.L.)."

C. Network Level Controllers shall have a 16 bit based microprocessor with EPROM operating system. DDC programs and data files shall be in non-volatile EEPROM or flash memory to allow simple and reliable additions and changes. Each network controller shall have an on-board 30 day battery back-up realtime clock. Controllers shall be provided as required with capacity to accommodate input/output (I/O) points required for the application plus any spare points as specified. Each panel shall be provided with a socket for a Portable Operators Terminal (POT), and a port for network communications at no less than 78,000 baud. Controllers shall have outputs which shall be binary for On-Off control, with true variable voltage (0-10v), for driving analog or pneumatic transducer devices. Analog outputs shall have a minimum incremental resolution of one percent of the operating range of the controlled device. Controllers shall have LEDs for continuous indication of all bus communications, power, and operational status. All panel electronics and associated equipment shall be installed in suitable enclosures.

D. Terminal Equipment Controllers (TEC's) shall be UL916 standalone EEPROM based and configured to perform the sequences specified, and with I/O selected for the application. TEC enclosures shall be compact plastic conforming to UL94-5V or plated steel. Each TEC shall be provided with LED type annunciation to continually display its operational mode; power, normal, or in an alarm state. TEC networks operating on a 9000 baud rate shall be grouped with no more than 20 TEC's per primary bus connected device. For TEC networks operating over 50,000 baud, up to 100 TECs may be so grouped.

E. Furnish and ship damper actuators and terminal unit controllers to the terminal unit manufacturer for factory installation. Refer to Specification Section 23 30 00 and Drawings for coordination details. Terminal unit manufacturer shall furnish transformers, relays, air flow rings, and all metal control enclosures. Under this Section of the Specifications, provide the terminal unit manufacturer with necessary wiring and mounting instructions.

F. General:

1. Software development and programming shall be as directed by the Owner and as described herein. Contractor shall install all program operating time schedules as furnished by the Owner. During construction, the Contractor may operate equipment in what is considered a Construction Schedule. The control systems installer, at Substantial Completion, shall remove such schedules and replace these with individual, independent, operating schedules for each system and individual piece of equipment, specifically air handling equipment.
2. Program trend logging of all analog and binary points of control at intervals as directed by the Owner, initially use five (5) minutes for all control points.
3. Overall systems control shall be performed by a field programmable direct digital controller, microprocessor based, which incorporates Direct Digital Control, all necessary energy management functions and provides for digital display and convenient local adjustments of desired variations at each individual controller cabinet. This shall include scheduled programming and system interlocks.
4. DDC control units and all hardware shall be capable of continued operation at room temperatures of 40 Deg.F. to 120 Deg.F. and humidity from 10% up to a non-condensing point of 90%. All inputs shall be capable of withstanding continuous shorting to 120 VAC.
5. Provide any external electrical power supply protection devices to protect controllers from external voltage surges to include high voltage and lightning disturbances/protection.
6. Provide function switches in a local control panel, if not integral with the DDC controller, with "on-off" control and a "manual-auto" switch for each new DDC output (contact type) with switch status information being available to the central systems historical data files for all air handling units, fan coil units over 2000 CFM in capacity, pumps, chillers, controlled exhaust fans over 2000 CFM in capacity, boilers and cooling towers. Alternately, provide this capability integral with the Direct Digital Controllers. Terminal units such as Variable Air Volume boxes, small exhaust fans, small fan coil units, and rooftop A/C units are not required to have function switches. Switches shall be concealed within the local control panel or digital controller enclosure to be lockable. The network manager software shall identify points that are locally overridden and report by display to the building CPU to include generating a printout at the local or remote location printer.
7. Provide a hard wire connection between the Building LAN serving all new Controllers to the Central Facilities Energy Management System. Verify dependable utilization of this system and transfer of local system data and functions to the existing control system CPU. General data reporting and alarms transmission shall be verified.
8. Energy Management System programs shall include, but not all are necessarily utilized, but shall not be limited to:

   a. Optimal start-stop using an adaptive algorithm to prevent the need for manual adjustments of parameters.
   b. Optimization programs controlling equipment using outdoor dry bulb and dew point temperatures. The outdoor wet bulb temperature shall be calculated by the following equation:

$$WB = (DB-DP)K+DP \text{ where } K = 0.560-0.0068\ (DP-30)$$

G. Control:

1. Control algorithms shall be available and resident in the digital system controller to permit Proportional, Integral, and Derivative control modes in any combination to meet the needs of the

application. Other control modes such as incremental, floating, or two-position must be available to adapt to job needs.

2. All control shall be performed in a digital manner using the digital signal from the microprocessor based controller converted through electronic circuitry for modulation of electric actuators.
3. Provide sensitivity adjustment for all DDC output control points.
4. The library of routines available in firmware must be capable of generating additional programs as may be required for specific client tailored requirements. The Owner shall be capable of revising programs without the aide of the installer.
5. Adjustments of all new control variables shall be conveniently available at the computer terminal through the use of the keyboard and display. The adjustments shall include, but not be limited to, proportional gain, integral rate, the velocity and acceleration constants associated with incremental control and on/off values of two-position control.

H. Field Programmable:

1. The local DDC controllers shall each contain all necessary mathematic, logic, utility functions; and all standard energy calculations and control functions in ROM to be available in any combination for field programming the unit. These routines shall include, but not be limited to:

   a. Math Routines:

      1) Basic Arithmetic
      2) Binary Logic
      3) Relational Logic
      4) Fixed Formulas for Psychometric Calculations

   b. Utility Routines for:

      1) Process entry and exit
      2) Keyboard functions
      3) Variable adjustments and output
      4) Alarm Indication
      5) Restart

   c. Control Routines for:

      1) Signal compensation
      2) Loop control
      3) Energy conservation
      4) Timed programming

2. Final field programs shall be stored in battery backed up RAM or in permanent memory.

I. Expandability: The DDC shall be expandable by adding additional field interface units that operate through the central processor of the DDC. The processor in the DDC shall be able to manage remote field interface units thereby expanding its control loop and energy management point capacity. Remote units shall be able to stand alone and have two-way communication in a LAN configuration. Systems furnished shall be fully manufacturer supported and under current production.

J. Calibration Compensation: To maintain long term analog accuracy to the controller sensing circuits, the DDC shall sense the voltage being supplied to the resistance sensing element and through firmware compensate for power supply changes due to long term drift or drift due to ambient temperature changes at the power supply.

K. Battery Backup:

1. New DDC system controllers shall be supplied with a minimum of 48 hours of nickel-cadmium battery backup, during power outages, for the RAM, with an automatic battery charger to maintain charge while power is on, to prevent internal component damage or failure.
2. DDC modules shall have automatic restart capabilities with sequencing after a power failure without program interruption. All EMS controlled equipment with motor loads of one horsepower, or

equivalent, and larger shall be started after power resumes in equal load groups in intervals of every 20 seconds, adjustable, to minimize electrical demand.

L. Associated Hardware:

1. All actuators for valves and dampers shall be supplied under this section of the specifications.
2. Where modulating electric actuators are used they shall be compatible with the (pulse width modulated) output of the Digital System Controller.

M. Diagnostics: The Digital System Controller shall contain in its program a self test procedure for checking the digital controllers, and by means of a non-destructive memory, check the computer.

N. Default Operating Procedure and Alarms:

1. All variables shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.
2. All alarms (a pump that did not start, etc.) and all deviation alarms (temperature, off, normal, etc.) will report to the CPU the type of alarm, designate equipment or system effected, date and time of alarm. A hard copy printout of alarms shall be generated at the CPU location. A scan can then identify all alarm conditions and their identifier.

O. Cabinet:

1. The DDC modules shall be enclosed in a metal frame cabinet. The cabinet shall be constructed such that it can be mounted and electrical terminations can be made during the construction phase of the project. The DDC electronics are to be removed and added at a later date, only prior to start-up.
2. Cabinet shall be installed on the wall in the Mechanical Rooms or elsewhere as indicated.
3. DDC cabinets shall be provided with a key lock. All cabinets on each installation shall utilize one master key.
4. All control wiring and system communications shall be electrically terminated inside DDC cabinets.

P. U. L. Approval: The DDC system panels shall be an approved U.L. System, with U. L. listing as a Signaling System.

Q. System Architecture: The network architecture shall consist of two levels. The top level controller shall contain a high speed LAN communication bus capable of sharing data over RISD's TCP/IP Ethernet Wide Area Network. Top level controllers will also contain a communication bus to lower level controllers, referred to throughout the specification as the field bus. The second level shall be a RS485 bus to support a family of dedicated local controllers for control of HVAC equipment and miscellaneous points of monitoring and control.

1. Field Bus

a. The Level 2 bus, or field bus, supports local control units of modular size for operation of the building's HVAC and lighting systems. This RS485 bus shall operate at a minimum speed of 19200 baud, with a minimum length of 4000 feet or 32 nodes before requiring a network repeater. A minimum of 16 HVAC or access controllers shall be configurable on the field bus. Manufacturers with baud rates of less than 19200 shall be limited to 64 Level 2 controllers to insure adequate global data and alarm response times

b. The field bus shall permit peer to peer communications among all Level 2 controllers and allow simultaneous communications with laptop computer service tools that are connected to a Level 2 controller. Failure of the Level 1 controller will not impair the operation of its associated field bus.

2. Network Transparency

a. All points contained on Level 1 and Level 2 controllers shall be considered global points. Any program in any controller on the network shall be able to reference any point in any controller regardless of its location on the network.

3. Workstation Communications

   a. Existing workstations located within the Administration Annex shall be able to communicate to the communication controller via a high speed WAN communication bus capable of sharing data over RISD's existing TCP/IP Ethernet Wide Area Network.

4. Dial-up Communications

   a. It shall be possible to access the network remotely through a standard dial-up modem. This modem shall permit direct access to the high speed LAN via a Level 1 network controller. It shall be possible to configure multiple modems in Level 1 network controllers to enable multi-user communications when more than 1 telephone line is available.

R. General software features of the CPU and field controllers, with sufficient internal memory, shall include the following as a minimum (although not all are necessarily used):

1. Start-Stop Functions
2. Optimized Start-Stop Control (warm-up and cool-down)
3. Time Programmed Commands

   a. Normal occupancy
   b. Holiday
   c. Occupancy overrides
   d. Schedules shall be programmable up to one year in advance with system wide or global scheduling and local, point by point scheduling.

4. Duty Cycle Control
5. Night Setback/Setup
6. Electric Demand Limiting
7. Override Feature
8. Run Time Totalization with data in non-volatile module memory.
9. Provisions shall be made for on-line programming and override.

S. On/Off Points of System Control shall be provided for the following:

1. Rooftop A/C Unit: RTU-Gym

T. Run Status (On/Off) of all units indicated above shall also be provided and shall be capable of being accessed for on-line programming. Status shall be by means of the local motor controller through the use of adjustable current sensing relays, or air flow differential pressure switch. For motors operated with variable frequency drives use the status from the drive. Coordinate the means of status with all equipment furnished.

U. Failure Alarm Status for the following EMS controlled items shall be provided through the EMS:

1. Combined Safety Alarm, one (1) for each RTU.
2. Low/High Temperature Alarms for each temperature sensor installed, four (4) Deg.F. above or below set point, adjustable.
3. High Relative Humidity Alarm for each space and return air relative humidity sensor installed; on a rise above 65% R.H., adjustable.
4. High Carbon Dioxide Level Alarm for each carbon dioxide sensor installed, on a rise above 1300 Parts Per Million, PPM, adjustable.
5. Emergency Overflow Condensate Moisture Detection/High Water Level Alarm (all rooftop units): De-energize unit served and sends alarm to EMS.

V. Provide cumulative run time logging and indication for equipment noted in Paragraph "R", above.

W. Provide analog indication for the following:

1. For each Rooftop A/C Unit:

   a. Space temperature, Deg.F.
   b. Supply air temperature, Deg.F.

c. Space Relative Humidity, % R.H., new units only (except as noted below where units share common sensor).

2. Re-use existing indication of outside air temperature in Deg.F for this building.
3. Re-use existing indication of outside are relative humidity in % R.H. for this building.
4. Space Carbon Dioxide Level, PPM, for:

a. Gymnasium

X. Building Computer Software Management features

1. Provide minimum of 15 User Selectable Passwords with a minimum of three levels of access. Highest level provides system access, secondary level provides access for command to field devices only, lowest level provides monitoring capabilities only with no field control allowed. Password access will be logged with time/date stamp and associated user ID.
2. Provide a minimum of 16 Point Group Summaries with each point inclusion selectable by system operator. Summaries will have a minimum of six (6) character identifiers for each group. A separately selectable All Points Summary shall be available to the operator for a view of the complete system. Alarm Summaries, listing all points in an alarm status shall be provided, and shall be Owner definable.
3. Trend logs and summaries:

a. The Central Computer Workstation (CPU), shall be provided with, as a part of this contract, the ability to periodically trend any hardware, software, or simulated point within any of the attached DDC panels, for this project, at an Owner selectable interval of a minimum of once per second, up to at least once per 1000 minutes.
b. The trending programming for selected points and all feature attributes of these points shall be accomplished online at the CPU with no disruption of dynamic communication with the remote DDC panels. The operator shall be able to add, delete, and modify points and attributes at any time while online. Online programmable attributes shall include:

1) Point addition, deletion, and modification
2) Sampling intervals and ranges
3) Historical samples to be stored per individual point
4) Dynamic data values
5) Engineering units of each point

4. Online editing capabilities shall be provided for, but not limited to the following:

a. Add/Delete Points
b. Modify Engineering Units
c. Modify/Create Point Groups
d. Adjust Set Points
e. Adjust Individual Start/Stop Times
f. Trend Selected Points
g. Observe Any System Point, Hardware, or Software
h. This editing capability shall be for both CPU resident programs and remote DDC panel programs.

5. English language shall be used for all inputs, outputs, and display. Code or computer language will not be acceptable.
6. Remote DDC Field Communication: Communication between the Central Computer Workstation and the remote DDC panels shall be achieved via digital transmission utilizing a distributed polling technique for recognition of all field points, both software and hardware points status, issuing of commands, programming of DDC units, etc. Additionally provide software for the existing Central Computer to allow the same interaction/communication features as noted for the Computer Workstation Building. Data transmission shall be via hardware connection compatible with electric category Type 3002, as described in Bell System Technical Publications for Data Transmission using 9600 Baud Rate.

7. New field panels/controllers shall be able to communicate with the existing front end system same as currently exists.
8. CRT Format:
    a. The CPU CRT format shall include and display in an individually dedicated and protected area of the viewing screen the following Dynamic information:
        1) The current time, date, and day of week (including Holidays).
        2) Sequential as occurred alarms.
        3) Visual indication of alarm or off normal conditions which are active.
        4) Current operator identification.
        5) Operator work area to display various forms of point information issue commands, and data base information relevant to current activities.
    b. Operator will have full access to the system for issuing commands, etc. while this display is active.
9. Provide a graphic software package and programming to result in a schematic illustration for each controlled piece or group of pieces, of equipment to illustrate all related controlled variables, setpoints and operating parameters. Additionally provide a building floor plan with room numbers and locations of all space sensors and controlled equipment. The user shall be able to click on any feature to pull up related system graphics.

2.9 WEB BROWSER INTERFACE

A. Provide Internet/Intranet Connectivity utilizing a Web Browser as follows:

1. Shall be a “Server” based product that provides browser access to Ethernet enabled automation controllers. Access is accomplished by utilizing Microsoft Internet Explorer 11.0 or later. No other “client” side software shall be necessary to view and utilize the system. The “Server” hosting the Web Application can be located anywhere on the Internet. The software functions by taking real-time data from the active automation systems and combining that information with the appropriate graphic file in an HTML format to be viewed by the web browser. The number of simultaneous users connected to the web application shall only be limited by the capability of the server hosting the application. The application should be able to service multiple sites.
2. The graphics utilized for this system shall not require external applications to convert the images for use between the web server based application and the traditional graphical user interface. Graphics shall be interchangeable between applications.
3. Web Browser Server shall receive server-based software which shall support Microsoft’s .NET standards for the exchange and interoperability of information and data.
4. **Server-based software upgrades shall be free to the owner for the first five (5) years the server is owned by the building Owner.**

B. The Host Server (existing) shall be reused and shall meet the minimum requirements noted for data servers.

C. The Web Browser Interface shall include the following user configuration requirements:

1. Usernames and passwords can be setup via the Web Browser Interface. Physical access to the server is not required but will be password protected.
    a. Individual user names/passwords are to be utilized.
    b. Usernames/passwords can be specifically unique to allow the user to be automatically redirected to a specific site, and or graphic display when logging into the system.
2. Passwords can be configured to allow the user to modify setpoints or not.
3. All user configuration functions shall be provided through an intuitive graphical user interface.
4. Web Browser Interface shall not require any external applications, “Client Side” software or “Plug-Ins” to connect, view, or control any aspect of the building automation system.
5. Access to the installed automation system shall be performed through Microsoft Internet Explorer.

D. Site Graphics shall meet the following requirements:

1. Graphics displayed through the Web Browser Interface must be the same graphic images provided through the Graphical User Interface described above. No external applications are to be required to interchange graphic images between the web server application and the graphical user interface.
2. Trend data must be able to be displayed graphically and in “spread sheet” format without the addition of any additional client side software, plug-Ins, or additional applications.
3. Digital Start/Stop Logging shall be able to be displayed and printed from the browser interface without the addition of any additional “client side” software, plug-Ins, or additional applications.
4. The display and printing of alarm data shall be performed without the addition of any “client side” software, plug-Ins, or additional applications.
5. Points that are manually overridden shall be displayed on the graphic screen by an icon adjacent to the overridden point to provide a quick visual indication of any points on the screen that are overridden.
6. The viewing and modification of weekly schedules shall be performed in a graphically intuitive manner that is consistent with the non-Web Enabled application. This shall be performed without the addition of any “client side” software, plug-Ins, or additional applications.
7. The viewing and modification of annual holiday schedules shall be performed in a graphically intuitive manner that is consistent with the non-Web Enabled application. This shall be performed without the addition of any “client side” software, plug-Ins, or additional applications.
8. “Right clicking” on the point and modifying the value shall perform the editing of point values.
9. Points can be placed in “manual” or “automatic” mode from the Web Browser, providing password restrictions for the user allow such functionality.”

2.10 ELECTRICAL WIRING

A. All wire, wiring, and conduit required for the operation of the control system shall be the responsibility of this section of the specifications and shall be installed as described and in full accordance with the requirements of Division 26 of these Specifications.

B. The control manufacturer shall be responsible for supplying complete and approved wiring diagrams and installation supervision of the wiring of the control system and shall perform all necessary set-up and calibration labor.

C. Starters, furnished in other sections of these specifications, shall be installed under Division 26, but all wiring from auxiliary contacts or relays shall be under this section of the specifications.

D. All wiring, including Class 2 signal wiring, shall be installed as a Class 1 electrical system as defined by the National Electrical Code (NEC).

E. All control conduits with #8 conductor or smaller (cross-sectional area) shall have one pull wire each run in conduits carrying 5 or more conductors. Conduits with 9 or more conductors shall have two pull wires installed. Terminate pull wires at control panels in an acceptable manner and tag wires as “future”.

F. The electrician shall be licensed by the City and local authorities having jurisdiction over the area in which the work is to be performed.

G. All class 1 control wiring conduit shall be run with not more than 30% fill based on inside conduit diameters and cross-sectional area. This provision is for future modifications or additions to the control system.

H. All conduit carrying shielded twisted pair cabling, communication, or signal, Class 2 wiring, shall be sized for a maximum of 40% fill based on inside conduit diameter and cross-sectional area. This provision is for future modifications or additions to the control system.

I. All wiring shall be run in conduit. All Class 1 power wiring shall be run in conduit. All Class 2 signal wiring, low voltage control type, shall be run in conduit. No exposed wiring of any kind will be allowed.

Class 2 signal wiring may be installed above accessible lay-in ceilings only if run-in plenum rated cable supported independently from structure and run parallel and perpendicular to the structure.

J. All conduit shall be 3/4 inch size minimum, except raceways terminating at control devices manufactured with 1/2" knock-outs, i.e., conduit from junction box to smoke or fire detectors (local single device wiring only).

K. Electrical Systems Installer on project may perform temperature control conduit and wiring installation on project only that this portion of work shall be bid directly to the Temperature Control Systems Installer, and all work in relation to temperature control wiring shall be done subordinate to this Section of the Specifications. Wiring terminations shall be under this Section of the specifications.

L. Under this Section of Specifications, furnish and install, at an early stage of construction (when walls are being constructed) galvanized steel back boxes for all wall mount space sensors, suitably secured with 3/4" EMT routed to four inches (4") above an accessible ceiling. Install with pull wire for installation of sensors and related wiring at a later stage of construction. For existing construction, either fish flexible conduit down accessible walls, use surface mounted wire mold components on masonry walls (color to be approved by Architect) in finished areas, or use surface mounted EMT in unfinished areas.

M. Work Not Included Under this Section of Specifications: The Electrical Systems Installer shall provide:

1. Branch circuit and motor feeder circuit conductors, raceway, connections, and overcurrent protection for each motor or item of equipment furnished by the Owner or other Contractors.
2. Installation of motor controllers furnished by the Owner or other Contractors, along with branch circuit and motor feeder circuit conductors, raceway, and connections in accordance with the manufacturer's approved wiring diagrams.
3. Disconnect switches, where indicated on the drawings or required by codes, except as provided as an integral part of manufactured equipment.
4. Power supply conductors, raceway, connections, and over-current protection for input power to HVAC Temperature Controls, HVAC Automation, and HVAC Energy Management Systems in accordance with approved rough-in and connection diagrams furnished by the system suppliers only when shown on Division 16 (or 26) Drawings.
5. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to insure that all work is contained within the General Contract. The Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.
6. Nothing herein shall be construed to confine the Contractor from assigning the work to any single member or group of systems installers deemed best suited for executing the work to effect completion of the contract. Refer to specific bidding instructions of the General Contract for the actual division of the work.

N. Work Included Under this Section of the Specifications: The Mechanical Systems Installer shall provide:

1. Motors and equipment, erected in place and ready for final connection of power supply wiring, along with manufacturer's approved wiring diagrams.
2. Motor controllers, in suitable enclosures and of the type and size in accordance with the manufacturer's recommendations and NEMA requirements, along with properly sized overload elements or devices which are normally provided as part of manufactured equipment.
3. Disconnecting switches or devices which are normally provided as a part of manufactured equipment.
4. Rough-in and connection diagrams for input power supply and connections for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems.
5. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to insure that all work is contained within the General Contract. The Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.

O. Contractor, under this section of the Specifications, shall insure the furnishing and installation of:

1. All new branch circuit wiring, conduits, protective devices and accessories for power wiring to serve new control panels, control transformers, electric control dampers and valve actuators, combination fire-smoke dampers and any other control system power requirements where not shown to be performed by others. Field verify spare electrical circuits available where applicable. Do not tap into existing branch circuits without approval by the Owners Representative. Run all new circuits back to electrical feeder panels.
2. Conductors and raceways for the HVAC temperature control, HVAC automation, and HVAC Energy Management System in accordance with approved rough-in and connection diagrams furnished by the system suppliers.
3. Termination of all conductors, raceways, devices, and connections for low voltage systems for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems in accordance with the provisions of Division 16, and approved systems shop drawings to provide complete operating systems in accordance with the functional requirements of the specifications.

P. Wire all safety devices in series to include freezestats, smoke detectors, and static pressure high limit controls; any single device when tripped, shall de-energize air handling equipment.

Q. Wiring Requirements shall also include the following:

1. The conduit/wiring system required for the Automatic Temperature Control (ATC)/Energy Management System shall be a complete, separate, independent system. Conduit sharing with other unrelated electrical systems is not permitted.
2. All wiring shall be labeled at both ends and at any spliced joint in between. Wire and tubing shall be tagged using 3M, Scotch Code Write On Wire Marker Tape Identification System; product number SWD-R-11954 with 3/4" x 5/16" write-on area or SLW 12177 with 1" x 3/4" write-on area and with 3M Scotch Code SMP Marking Pen. In addition to tagging at field device end and at spliced joints, a tag shall be placed 6" after entering each DDC panel. Identification and tag information shall be included in engineering/wiring submittal which must be submitted for Owner approval prior to beginning work. Tag information shall coincide with equipment/point information as written in the specification Input/Output summary.
3. Digital Input (D.I.) wiring (Class 2) may be run in a common conduit with Digital Output (D.O.) Wiring (Class 1) where local codes permit.
4. Analog Input (A.I.), Analog Output (A.O.), Digital Input (D.I.), and Network Communications Trunk (N.C.T.) wiring may be run in a common conduit.
5. Digital Output (D.O.) wiring run in a common conduit with Analog Input (A.I.), Analog Output (A.O.), or Network Communication Trunk (N.C.T.) is not permitted under any circumstances.
6. AC line power to DDC panel shall be #12 THHN.
7. Digital Output (D.O.) wiring shall be minimum #16 THHN.
8. Digital Input (D.I.), Analog Input 4-20 mA (A.I.) and Analog Output (A.O.) wiring shall be min., #20 TSP (twisted shielded stranded pair with drain wire).
9. Analog Input or voltage types (A.I.) wiring shall be min., #20 TSP (twisted shielded stranded pair with drain wire).

2.11 GENERAL

A. System shall be installed complete with DDC panels, remote panels, thermostats, sensors, control dampers, all actuators, switches, relays, alarms, etc., and control piping in accordance with the extent of the sequences of operation. Provide all auxiliary equipment required. All controls shall be installed under this section of work, with the exception of automatic dampers and taps for flow switches and pressure sensing devices which shall be furnished under Section 23 30 00.

B. Control Systems manufacturer shall submit a complete and final check list verifying final calibration and set points for each system prior to final construction review.

C. Complete control drawings shall be submitted for approval before field installation is started. The submittals shall give a complete description of all control devices and show schematic piping and wiring, as well as a written sequence for each operation.

D. All control dampers shall be furnished by Control manufacturer and shall be set in place, under other sections of the specifications, and be adjusted for proper operation, including the installation of necessary linkages with actuators under this section of specifications. Contractor shall also furnish, under other sections of the specifications, install any necessary blank-off plates required to fill duct when damper size is smaller than the duct. All outside and relief air damper frames and blank-off plates shall be caulked air tight with non-hardening silicone caulking to the ductwork or frame opening.

E. Work under this section shall regulate and adjust the control system, including all controllers, thermostats, relays, motors, and other equipment provided under this contract. They shall be placed in complete operating condition subject to the approval of the TAB firm. Contractor shall cooperate fully with the balancing agency in the testing, check-out and adjustment of the various systems. Contractor, under other sections of these specifications, shall install all automatic dampers.

F. Control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from the date of "Substantial Completion", any of the equipment herein described is proven to be defective in workmanship or material (except electrical wiring done by others), it shall be adjusted, repaired, or replaced free of charge.

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATION - ROOFTOP UNITS WITH HOT GAS RE-HEAT (SINGLE ZONE TYPE) - (3 TONS AND LARGER)

A. The direct digital control system shall monitor and control each rooftop A/C unit. An electronic room temperature sensor shall, through a local terminal unit DDC Controller, one per unit, control its DX Cooling (minimum 1-stage for units 7 tons and smaller or 2 stage (required on units over 7 tons in size)), hot gas reheat coils, 2-stage gas heaters (for units 3 tons in size and larger) and economizer, outside, return and relief/exhaust air dampers to provide the following sequences:

1. The DDC controller shall be of the automatic change-over type to provide for a heating and a cooling set point to be software interlocked to prevent the cooling set point from being set below the heating set point and vice-versa. Provide for a minimum 2 Deg.F. dead band between set points, adjustable up to 5 Deg.F.
2. Include optimized start and stop features for unit control where the space temperature is compared to the ambient outdoor air temperature to calculate the minimum run time necessary to attain the normal mode set point by the occupied time scheduled.
3. Any time the rooftop A/C unit is in operation in the “Occupied” mode, the outdoor air damper shall open to its minimum position except during morning warm-up (optimized start), night set-back, morning cool-down (optimized start) and night set-up. For units specified to have carbon dioxide sensors, the outside air dampers shall remain closed in the occupied space, except when the unit is operated in the normal occupied mode in which case the outside air dampers shall open to the minimum-minimum position scheduled. Once the carbon dioxide set point of 1,100 PPM, adjustable, is reached; the outside air damper shall modulate further open to maintain this set point but in no instance shall it open beyond the minimum-maximum position scheduled.
4. Upon a need for mechanical cooling, the DX cooling system shall be energized in such a manner as to maintain a stable space temperature set point of 74 Deg.F (adj.). On a rise above set point the 1st stage of cooling, first compressor, shall be energized. For 2 stage units the second compressor (or stage) will only be energized upon a further rise above set point and when the first compressor (or stage) has been on longer than 5 minutes, adjustable. On a decrease in demand for cooling the second stage compressor (or stage) shall be cycled off. On a further decrease in space temperature, the first stage compressor shall be cycled off. Each stage of cooling shall have a minimum off time of approximately 5 minutes (Variable as determined through PID loop control).
5. The space relative humidity (R.H.) sensor shall, through its DDC controller output signal, cause the unit to go into the dehumidifcation mode only when there is not a sensible cooling demand; and, upon a rise in space R.H. above set point, 60% R.H., adjustable. All units shall have a hot gas reheat coil, energized via a hot gas solenoid valve, which shall be used to reheat the supply air to a nearly neutral temperature only when in the dehumidification mode. Provide R.H. sensors for all

units. Should the space temperature drop to below the heating set point, the dehumidification mode shall be de-energized and the gas heat shall be allowed to cycle on as needed to satisfy the heating set point once the compressor is cycled off.

6. The heating temperature set point shall be 72 Deg. F., adjustable. On a drop in space temperature below heating set point, the furnace section shall be energized, in stages, as required, to maintain set point. The cooling system and hot gas reheat shall be de-energized while heating with natural gas. A supply air high limit control feature shall be provided to prevent the supply air temperature from raising above 90 Deg.F. by overriding and de-energizing the heat as required. The heat, when a demand for heat remains, shall shut-off for a minimum of three (3) minutes, adjustable, and be energized when the supply air temperature drops (fan runs continuously) below 80 Deg.F., adjustable. For 2-stage heating units, the furnace heating sections will stage on as required to meet demand in a stable fashion.
7. When the outdoor air temperature is below 65 Deg. F., adjustable, the economizer dampers shall modulate, in sequence, as required, to satisfy the space temperature sensor's cooling set point. If the economizer can not satisfy the space temperature set point (100% open) then energize the cooling system of compressor(s), as required. No enthalpy or return air comparison economizers allowed. Should the space relative humidity rise to 60% RH, adjustable, while in the economizer mode inversely reset the outside air dry bulb set point downward until the relative humidity drops to below 60% R.H. (use a 4% R.H. differential). Carbon dioxide sensor control shall be disabled when the unit is in the economizer mode. All other units have two position motorized (closed/minimum) outside are dampers.
8. An evaporator fan differential pressure switch will be interlocked through the DDC system in such a manner that anytime the unit fan is de-energized the gas fired heat and cooling compressors will also be de-energized unless operated for a heat purge sequence upon furnace shutdown after which time the furnace will shut down.
9. Space temperature sensors will also be used to operate the units in the unoccupied modes of operation.
10. During the optimized start morning "warm-up" mode (winter), the air unit fan motor will be cycled on and the unit furnace will be energized, as required, to bring space temperature to the normal heating set point. During this mode the minimum outdoor air damper will be closed. When the space reaches warm-up set point, one (1) Deg.F. below the heating set point, the unit will then be allowed to operate in the "occupied" mode at which time the outdoor air damper will be allowed to open to minimum position, or be controlled by a carbon dioxide sensor as indicated elsewhere herein, and the system will be controlled as described above. Warm-up shall occur not more than once each day. The discharge air temperature high limit control sequence shall remain in control during the morning warm-up mode.
11. During the optimized start morning cool-down (summer) mode, the air unit fan motor will be cycled on and the unit cooling system will operate at the capacity as required to bring the space temperature to the normal cooling set point. During this mode, the outdoor air damper will be closed. When the space reaches cool-down set point, one (1) Deg.F. higher than the cooling set point, the unit will operate in the occupied mode at which time the outdoor air damper will be allowed to open to its minimum position, or be controlled by a carbon dioxide sensor, as indicated elsewhere herein, and the space temperature sensor will control as described above. Cool-down shall occur not more than once each day.
12. During the night set-forward and night set-back modes the equipment will be cycled as required to maintain those set points; on at 80 Deg.F. and off at 76 Deg. F., adjustable, for set-forward and on at 55 Deg.F. and off at 60 Deg.F., adjustable, for night set-back. The outdoor air dampers shall be closed in both of these modes. The discharge air temperature high limit control sequence shall remain in control during the night set-back mode.

B. Rooftop A/C units shall be furnished with factory assembled modulating economizers with digital controller which shall be interfaced in such a manner as to:

1. Allow the mechanical cooling system to be locked out and economizers to be enabled and disabled as hereinafter described. However, should the economizer be unable to maintain the cooling set point, the mechanical cooling system shall be energized as needed.
2. Digital controller shall be interfaced in such a manner that when the A/C unit is in the economizer mode of operation it shall be controlled so it opens the outdoor air, above minimum setting, where applicable, only on a cooling demand by the space temperature sensor.

3. Instrumentation and Control system provider shall furnish and install all necessary signal conditioners, relays, etc. to perform the economizer interface as described herein. Coordinate these requirements with each specified equipment manufacturer.
4. Provide for a discharge air temperature control, which shall prevent the discharge air temperature from dropping below 53 Deg. F., adjustable, when the unit is operated in the economizer mode. Override the economizer dampers as needed to achieve this low limit condition. Coordinate this provision with each specified equipment manufacturer.

C. Provide a wall mounted carbon dioxide sensor which shall modulate, via an analog signal to the rooftop unit, the return and outside air dampers, in sequence, to maintain a maximum level of 1000 Parts Per Million (PPM), adjustable for following units:

1. Gymnasium units (One sensor in space).

D. Outside air dampers of multiple units shall modulate together when they are energized.

E. The return damper shall modulate from its fully open position to the corresponding sequenced position with the outside air damper, which shall go from its fully closed position up to its maximum-minimum value scheduled. The return air damper shall have a software safety interlock that will not allow it to go past 50% closed during mechanical cooling. Carbon dioxide sensor control shall be locked out when the unit enables the economizer cycle.

F. Should the space temperature drop to 1 Deg.F., adjustable, below heating set point while the RTU is operating in the dehumidification mode, the unit shall go into alarm and revert to fan and compressor or furnace cycling (on-off) to meet space temperature (sensible load only) requirements until reset.

G. Provide a condensate overflow moisture sensor/float in upper portion of drain pan that shall alarm the EMS and have a unit interlock shutdown when actuated. All units shall be provided with this.

3.2 SEQUENCE OF OPERATION - NIGHT SET-BACK AND SET-UP MODES

A. Night set-back and set-up modes shall be provided to keep equipment from operating except as needed to heat or cool the space to protect the building systems from freezing and potential water damage in cold weather or from excessive heat or humidity build-up in warm weather.

B. Designate one of the space temperature sensors shown on the plans, preferably located on an interior partition within 8 feet of a Northern exposure, selection as recommended by the balancing agency, to be used for night set-back control. Sensor, adjustable, shall be set for 55 Deg.F. Provide one per AHU for VAV units. For single zone systems, utilize the space temperature sensor shown. Use this same sensor for night set-up control which shall have a set point of 84 Deg.F., adjustable.

C. Below set-back setpoint, respective air handlers shall receive a control signal, fans shall be energized, and related heating equipment shall be started if not already energized, until all units are no longer in the night set-back mode, temperature rises above 60 Deg.F.

D. Above the night set-up set point, respective air handlers shall receive a control signal, fans shall be energized and related cooling equipment shall be started if not already operating, until the units are no longer in the night set-up mode, temperature drops below 80 Deg.F.

E. During the night set-back mode, lockout cooling system, ventilation cycles, morning warm-up and cool-down modes, night set-up mode, close all outside and relief air dampers, as applicable, and de-energize all EMS controlled toilet exhaust fans located in the areas served by the units being controlled.

F. During the night set-up mode, lockout the same systems, except allow the cooling system to be energized and lock-out the heating system.

3.3 SEQUENCE OF OPERATION - MORNING COOL-DOWN MODE

A. A morning cool-down mode shall be provided to cool the building, or area served by a system, to within 1 Deg.F. of the normal occupied cooling set point, adjustable, through the building Energy Management System optimized start feature.

B. Cool-down shall function the same as night set-up, except the set point shall be as noted above.

C. Lockout the cool-down mode after the cycle is completed until the following scheduled cycle, generally not to occur more than once per day.

D. During the cool-down mode, lockout the heating system, night set-back, morning warm-up, night set-up, close all outside and relief air dampers, as applicable, and de-energize all EMS controlled toilet exhaust fans in the areas served by the units being controlled.

3.4 SEQUENCE OF OPERATION - MORNING WARM-UP MODE

A. A warm-up mode shall be provided to warm the building, or area served by a system, to within 1 Deg.F. of the normal occupied heating setpoint, adjustable, through the building Energy Management System optimized start feature.

B. Warm-up shall function the same as night setback, except the setpoint shall be as noted above.

C. Lockout the warm-up mode after the cycle is completed until the following scheduled cycle, generally not to occur more than once per day.

D. Lockout the cooling system, ventilation cycles, night set-back, morning cool-down, night set-up, close all outside and relief air dampers, as applicable, and de-energize all EMS controlled toilet exhaust fans located in the areas served by the units being controlled.

3.5 ELECTRICAL INTERLOCKS

A. Certain electrical interlocks shall be as listed herein and in other sections of these specifications.

B. All electrical interlocks shall be made by means of auxiliary contacts on motor starters or shall be accomplished with separate relays unless indicated otherwise. No motor power lead shall be utilized in an interlock circuit, unless indicated otherwise. Each separate control power lead serving a starter shall be provided with a disconnecting switch suitably identified and housed, which may be a toggle switch or other suitable disconnecting device, of proper capacity and number of poles.

3.6 DDC CONTROL

A. Provide complete DDC Control for all equipment as indicated elsewhere herein.

B. Not more than one local unitary direct digital controller shall be utilized per AHU/piece of equipment.

C. Separate monitoring only control points not associated with specific pieces of equipment and which are global in nature are desired to be grouped together in a separate controller, or controllers, other than dedicated equipment controllers.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 SYSTEM DESCRIPTION

A. Furnish and install all piping of every kind required, specified, or shown on the Drawings for the installation of the work specified in Division 23. The location, direction, and size of the various lines are indicated on the Drawings. Lines for pilot and controls and instrumentation are not shown but shall be installed as required and as specified.

B. Piping systems shall include all appurtenances shown on the drawings and specified herein.

C. The work shall include the furnishing and installing of all supporting structures and members for pipes, ducts, and equipment.

D. Support devices and members shall include vibration and noise isolating devices and assemblies. Penetrations of walls to structure shall be sealed off to limit noise transmission through sleeves.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the best quality.

B. All equipment and materials shall be installed by experienced mechanics certified and trained for the work performed.

1.4 SUBMITTALS

A. Product Data: Submit complete manufacturer's descriptive literature and installation instructions in accordance with Division 1 for all piping materials to be used for each system, valves and hydronic specialties as specified herein.

B. Shop Drawings:

1. Submit in accordance with Section 01 33 23 and Section 23 05 00.
2. Submit 1/4" = 1'-0" Scale HVAC and Plumbing Piping Shop Drawings.
3. Overlay piping Shop Drawings over other Shop Drawings of other trades to include electrical and sheet metal Shop Drawings.
4. Plan views of congested areas and sections thereof shall be drawn at a scale of 3/8" = 1'-0".
5. A “Release of Liability” form must be signed after which a single CD will be produced.

C. Fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the Contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the Engineer.

1.5 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.

B. Storage and protection of materials shall be in accordance with Section 23 05 00.

C. Take special precautions to protect control valve internals from construction dirt and debris. If valves are stored on site cover valve openings until just prior to installation but in no case shall valves be unprotected for more than 48 hours.

D. Openings in piping system, coil headers, and other heat exchangers shall be covered during the construction period to protect the interior accumulation of dirt and debris in these systems until immediately prior to connection to these components to similarly protected systems.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. In general, the following listed materials shall be used in fabricating the piping systems. Where special classes of piping are involved and are not listed, the Contractor shall request instructions as to the class of material involved and the method of fabricating it before ordering the materials. Steel pipe 2-1/2" and larger shall generally have plain ends to be assembled by welding and pipe 2" and smaller shall generally have screwed ends, except where special requirements dictate otherwise.

1. Condensate drains from cooling coils: Type "M" or DWV (1-1/4" and larger) hard drawn copper below the roof.
2. Condensate drain lines with Pro-Press type fittings: Type “L” hard drawn copper tubing below the roof.
3. Refrigerant Piping: Type “ACR” hard drawn copper with 156 Silfos solder joints. Refer to specification Section 23 23 00, “Refrigerant Piping”.

B. Steel pipe shall be made and tested in accordance with the latest edition of the "Standard Specifications for Welded Steel Pipe" of the National Tube Company, or Youngstown Sheet and Tube Company. Piping 2" and smaller shall be manufactured by LeClede, Sawhill, or Wheatland. Piping 2-1/2" and larger shall be manufactured by Tex-Tube, Paragon, U.S. Steel, or Armco. Unless otherwise specified, all pipe shall be Schedule 40 of ASA Standard B36.10.

C. In general, fittings used for the various piping systems shall be as listed below. Special fittings shall be used where required by job conditions and when approved for particular use.

1. Welding Fittings: All fittings in welded lines shall be factory fabricated welding fittings of the same material and the same schedule or weight as the piping system in which installed.

a. All elbows, reducers, tees, caps and special fittings shall be standard factory fabricated butt welding fittings, conforming to ANSI B16.9, with the following exceptions: Branch takeoffs from lines 2-1/2" in size and larger and where the size of the takeoff does not exceed two-thirds of the nominal diameter of the mains to which connected may be made with shaped nipples or with Bonney or Grinnell Weldolets or Threadolets as required by the class of fabrication. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.
b. Welding fittings shall be Weldbend Corporation, Tube Turn, Hackney, or approved equals. Welding and fittings shall have the same bursting pressure as pipe of the same size and schedule. All elbows shall be the long radius type unless noted otherwise.

D. Screwed Fittings in Steel Lines: 150 lb. black malleable iron banded pattern screwed fittings made by Grinnell Company, Crane Company, or Walworth Company. All screwed fitting elbows shall be the long radius type unless noted otherwise.

E. Fittings for non-propress copper tubing shall be Chase Sweat Fittings, Nibco, Elkhart, or Mueller Brass Company's "Streamline" type solder fittings. Drainage type fittings shall be used wherever possible in drainage systems only. All solder for copper tubing shall be 95-5, Silfos or Eutectic No. 180F. All piping shall be installed according to the manufacturer's instructions. All joints shall be thoroughly cleaned before connecting. Silfos solder shall be used on all refrigerant piping. All elbows shall be the long radius type unless noted otherwise.

F. As an alternate to standard sweat fittings for copper tubing, Pro Press type fittings shall be allowed for all drain lines as follows:

1. 3" and smaller, wrought copper. Press fittings, or ASME 16.2.2, ASME 15.18 sealing with EPDM sealing element for ½" to 2" and ProPress XL for 2-1/2" to 3.
2. Contractor shall provide Owner at completion of project one (1) complete set (½" to 3") of new actuators and jaws.

G. Miscellaneous Fittings: Provide all reducers, increasers, adapters, bushings, etc., as required to properly inter-connect the various items, to change sizes, etc. Steel fittings shall be used in steel lines, and copper and red brass fittings shall be used in copper lines.

H. All piping materials and fittings shall be manufactured in the United States.

2.2 FLANGES

A. Flanges in welded lines for water systems shall be 150 pound forged steel, welding neck flanges, except where cast iron fittings are used as specified elsewhere in these specifications, and except as otherwise shown.

B. Flanges in screwed ferrous lines shall be 125 pound cast iron or 150 pound forged steel screwed flanges.

C. Where ferrous flanges connect to flat faced flanges on valves, items of equipment, etc., the companion flange shall be flush faced and where the flanges on items of equipment are raised face flanges, the companion flanges shall have raised faces.

D. Flanges in copper lines shall be solder joint type cast brass flanges.

E. Flange bolts and nuts shall conform to the applicable requirements of the latest edition of the Code for Pressure Piping.

F. Slip-on welding neck flanges are prohibited.

G. Flanges shall be Weldbend, Tube Turn, Hackney, or approved equals.

2.3 GASKETS

A. Install gaskets between flanges of all flanged joints. Where used with brass or bronze flanges or with flat face ferrous flanges, they shall be full face type. For all other flanges they shall be ring gaskets properly cut to fit within the inside edges of the bolts.

B. Gaskets in water lines shall be Garlock No. 24 Wire Insertion Red Rubber Sheet Packing, 1/16" thick and for any other systems use special materials suitable for the duty as recommended by their manufacturer.

2.4 INSULATING FITTINGS

A. Except that no dielectric fitting shall be installed in connections between copper or brass and sanitary cast iron waste, drain and vent lines, wherever an interconnection is made between ferrous pipes or vessel and copper tubing or brass pipe, or vice versa, install a dielectric fitting.

B. In lines assembled with screwed or soldered joints, use insulating couplings (unions) suitable for the intended service and where flanged connections are required, use insulating gasket material between

flange faces, insulating grommets between bolts and holes in flanges and insulating washers under both bolt heads and nuts.

C. PVC couplings of any kind shall not be acceptable for insulating couplings.

D. Insulating fittings shall be suitable for the service medium, operating pressure and temperature. Fittings shall be rated for 1.5 times the normal system operating temperature and pressure in which installed.

E. Insulating fittings shall be as manufactured by EPCO, Maloney, or Crane.

2.5 PIPE HANGERS

A. Pipe hangers shall be as manufactured by Anvil International, Inc. and be of a type suitable for each use. Approved equals by Mason Industries, Inc., B-Line, Grinnell, and PHD Manufacturing, Inc. will be considered.

B. For cast-iron pipes up to three inches (3") in size, use Anvil Fig. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil Fig. 590 steel clevis hanger. For cast iron plumbing piping four inches (4") and larger, use only Anvil Fig. 590 steel clevis hanger.

C. Where several pipes are routed parallel to each other and at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for elsewhere by these specifications.

D. For bare copper pipes (uninsulated only) up to and including three inches (3") in size, use Anvil Fig. CT-109 malleable iron, copper plated, split ring, hangers or Anvil Fig. CT-65 copper plated clevis hangers. For uninsulated copper pipes larger than three inches (3"), use Anvil Fig. CT-65 copper-plated clevis hanger.

E. Hanger rod sizes shall conform to the following schedule:

Pipe up to, and including 2"	3/8" rods
Pipe 2-1/2", 3", and 3-1/2"	1/2" rods
Pipe 4” and 5”	5/8” rods

F. Unless shown otherwise on the Drawings, all horizontal runs of ferrous piping shall be suspended from the floor or roof joists or beams, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and 3"	12 feet
Pipe 3-1/2” and 4”	14 feet

G. Unless shown otherwise on the Drawings, all horizontal runs of copper piping shall be suspended from the floor or roof joists or beams, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size	6 feet
Pipe 1" and 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and larger	12 feet

H. There shall be a hanger within two feet (2') of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps. Vertical pipes within a space shall have not less than two (2) supports. Where the vertical run of pipe in a space exceeds 14 feet then three (3) supports shall be required.

I. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.

J. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Anvil Fig. 281, wedge type, concrete inserts. All inserts shall be pre-treated to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.

K. Expansion bolts shall be Ackerman-Johnson.

L. Beam clamps suitable for the use with the type of steel construction involved shall be an Anvil product or an approved equal as indicated elsewhere herein.

M. No perforated straps shall be used to support any mechanical equipment item or piping of any kind.

N. Condensate drain piping hangers shall be sized to go around the insulation with shields being provided to protect the insulation. Shields shall be Anvil Fig. 167.

O. All steel hangers, base plates, supports, nuts, bolts, and all thread rod located outdoors, in crawl spaces, and exposed to the weather, shall be made of galvanized steel or equally suitable corrosion resistant steel alloy or aluminum. Where steel components are allowed and used under these conditions they shall be painted with an equivalent protective coating similar to a two-part epoxy. Refer to Section 09 90 00.

P. For pipe sizes 8" and under use Anvil Fig. #93 and 94 beam clamps. For pipe sizes 10" through 18" use Anvil Fig. #66 in the “U” position.

2.6 SLEEVES AND ESCUTCHEONS

A. Generally where pipes pass through interior building walls or floors above the first floor (out of the ground), 22 gauge galvanized sheet metal sleeves shall be used. Sleeves shall extend a minimum one inch (1") above a floor or beyond the wall, as applicable.

B. All pipes penetrating grade beams, exterior walls, concrete structural members, or concrete slabs of mechanical equipment rooms on the first floor shall generally use standard weight galvanized steel pipe as the sleeving material.

C. For concrete or masonry walls, sleeves shall be inserted into the masonry, decking or form work prior to the pouring or placement of concrete or masonry units to create a leave out.

D. The sizes of all sleeves shall be such as to permit the subsequent insertion of the intended pipe of the proper size with adequate clearance for movement due to expansion and contraction. In the case of insulated lines, the diameter of the sleeves shall be at least 1/2" greater than the outside walls of the pipe with specified thickness of insulation. This will require that the inside diameter of galvanized steel pipe sleeves be at least 1/2" greater than the outside diameter of the service pipe with insulation. Galvanized steel pipe sleeves set in floors shall project two inches (2") above the floor.

E. After the pipes are installed, fill the annular space between the pipe, and insulation as required, and its sleeve with an approved mastic or caulk. Use loose fibrous insulation packing as required to accomplish this. In all cases the annular spaces around the pipes within the sleeved openings shall be filled with loose fibrous insulation and then sealed with an approved caulking or expanded foam insulation.

F. Escutcheons, except as specifically noted or specified, shall be installed on all pipes passing exposed through floors, walls, or ceilings. Escutcheons shall be equal to the Crane No. 10, chrome plated sectional floor and ceiling plates, and shall fit snugly and neatly around pipe or pipe insulation or insulated lines. Solid chrome plates with set screws shall be used if sectional plates do not fit properly or stay in place. Where multiple pipes penetrate floors or walls in close proximity in concealed areas, shop made sheet metal escutcheons may be used.

G. Pipes sleeved through grade beams open to basements, crawl spaces or void spaces below grade shall additionally receive "Link Seal" or equal closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.

H. Where PVC pipes, 3 inches and smaller, and small copper water piping under 2 inches in size, penetrated a horizontal floor slab a metal sleeve will not be required. For these piping systems, completely wrap the piping with a polyethylene tape, or wrapping. This tape shall be minimum 4 mils thick and shall be wrapped at least two times around the pipe and secured sufficiently to hold the wrap in place during the pouring of the slab. This wrap shall be in sufficient length or height to insure that no concrete will be in contact with the pipe. All other piping shall be sleeved as indicated elsewhere herein.

I. Refer to Section 23 05 00 for additional requirements of penetrations through fire-rated assemblies.

2.7 ACCESS DOORS

A. Wherever access is required above inaccessible ceilings, in walls, furrings, chases or soffits to physically reach concealed piping, ductwork, fire/smoke dampers or mechanical equipment installed under Division 23, provide access doors of sufficient size to maintain, repair, replace or suitably access devices intended to be adjusted as indicated herein.

B. Provide an access door or panel for each of any valves, group of valves, damper pull rods, splitter dampers, manual volume dampers, actuators or other controlling mechanism installed under Division 23 which would otherwise be concealed in the building construction with no access.

C. All access doors in toilet rooms, locker rooms, showers, or other similar wet areas shall be the flush mounted type and be made of brush or satin finish stainless steel as manufactured by Milcor.

D. All access doors shall be minimum 12" x 12" in size unless otherwise approved in writing in advance by the Engineer. Doors shall be increased in size as required to allow for a person to reasonably access, adjust, maintain, service, inspect or replace the largest single component concealed. Provide special sizes of access doors as required.

E. Coordinate the final location of all concealed equipment and devices requiring access with the final location of the required access panels or doors. Allow ample space for the removal of all parts and equipment that require replacement or servicing.

F. Where mounting heights are not detailed or dimensioned, install mechanical piping and overhead equipment to provide the maximum headroom possible while maintaining reasonable access and service to those items being accessed.

G. Extend all equipment grease fittings to an accessible location which shall be within reach (maximum of 18") from the access door.

H. Install all access doors in locations to suit the intended purpose but have each location reviewed and approved by the Engineer. In no case shall access doors be located such that the intended purpose is rendered useless.

I. Access doors shall all have spring concealed hinges, screwdriver operated cam latches, be the flush mounted type, open up to, but not more than, 175 degrees, be made of steel, or stainless steel to suit the

application, be fire rated (U.L. rated) to match the rating of the surface where the door is placed, and have a powder coated electrostatic primer paint on all steel doors. Furnish the following access door types as described below:

1. Milcor Style DW - Flush drywall type with frame made of 16 gauge steel, panel door made of 14 gauge steel, galvanized steel drywall bead on frame, and removable hinge pins for removal of panel door. Provide minimum of two hinges (12" x 12" and larger) up to 24" x 24" in size and three hinges on access doors above this size. Provide one cam for access doors 14" x 14" and smaller and a minimum of three cams on larger sizes.
2. Milcor Style K - Flush plaster wall or ceiling type made similar to Style DW except with a 22 gauge expansion casing bead, one hinge on 12" x 12" access doors, two hinges on larger doors with either side no larger than 24", three hinges on doors with any dimension of 24" or larger, minimum one cam on doors with no dimension larger than 18" and two or more cams on larger access doors.
3. Milcor Style M or MS - Flush drywall, masonry or tile type made similar to Style DW except with 14 gauge steel frame and doors (16 gauge when made of stainless steel-satin finish), one hinge on access doors up to 18" x 18" in size, two hinges on sizes 20" x 24" and 22" x 22", three or more hinges on sizes 24" x 24" and larger, and the number of cams as standard with the manufacturer.
4. Provide other types of access doors suitable for the application to include surface mount, double leaf for access doors exceeding 36" in any dimension, louvered where indicated on the Drawings, fire rated, recessed or security/detention types as required and compatible with the surface penetrated.

PART 3 - EXECUTION

3.1 PIPING - GENERAL

A. Where special classes of piping are involved and are not listed, the Contractor shall request instructions from the Owner's Representative as to the class of material involved and the method of fabricating it before ordering any material. All steel lines 2-1/2" and larger shall be assembled by welding. All steel lines 2" and smaller may be assembled either by welding or by screwed fittings as specified.

B. Welding shall be done by mechanics who satisfy qualification requirements of the American Welding Society. The pipe ends to be welded shall be machine beveled wherever possible. Gas cuts shall be true and free from all burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe. Fully ream, to the full inside pipe diameter dimensions, the inside of all piping to be welded. Miter joints will not be allowed in any case. All headers, connections, elbows, reducers, flanges, and special flanges and special fittings shall be made using forged steel welding fittings of the same weight as the pipe to which they are attached. All unions and connections to valves 2-1/2" and larger shall be made by the use of welded flanges.

C. Branches in lines where the branch side is equal to 2/3 of the size of the main or smaller may be connected by using Weldolets or Threadolets; where the sizes are greater than 2/3 of the main, standard weight seamless tees as manufactured by Tube-Turns or Grinnell, A.S.T.M. Standard A-234 shall be used.

D. The location, direction, and size of all lines are generally indicated on the drawings. Branch connections in general are indicated and shall be so installed as to provide proper grades.

E. All lines shall be made up straight and true at proper grades. All water filled and condensate drain lines shall grade down to drains.

F. Piping shall follow as closely as possible the routes shown on the plans and take into consideration conditions to be met at the site. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after proper approval has been obtained.

G. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which the lines are connected.

H. All headers shall be assembled as indicated using welding fittings throughout.

I. All screw joints shall be made with taper threads, properly cut. Joints shall be made tight with graphite and oil applied to the pipe threads only and not to the fittings.

J. Dielectric couplings shall be installed where ferrous pipe joins copper lines and shall be rated for the intended medium pressure and temperature or service.

K. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of systems. No unions will be required in welded lines or lines assembled with solder joint fittings except at equipment items or coils, machinery items and other special pieces of apparatus. Unions in 2" and smaller lines shall be ground joint and unions 2-1/2" and larger shall be flanged unions. Unions shall be the same material and strength as other fittings in the lines. Companion flanges on lines at various items of equipment, machines, and pieces of apparatus shall serve as unions to permit removal of the particular item.

L. All piping shall be supported by hangers independently of equipment connections. The weight of the piping and its contents shall not be imposed on the equipment in any way.

M. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

N. Swing joints or expansion loops shall be provided wherever shown on the Drawings or wherever else necessary to allow for the expansion and contraction of piping. This shall be accomplished in an approved manner and this Contractor shall be responsible for any damage which may occur as a result of expansion and contraction of his piping.

O. Nipples shall be of the same size and material as the piping in the system in which the nipples are installed, except that "close", or "all thread" nipples shall not be used.

P. Keep all open ends of piping in each system plugged or capped to prevent dirt or other debris from entering the pipe at any and all times during construction and before fixtures or equipment is connected. All piping shall be flushed clear prior to connection to the central building systems.

Q. The ends of all piping furnished and installed in all systems shall be thoroughly reamed to the full inside diameter of the respective pipe.

R. Exposed and concealed lines shall be run parallel with, and perpendicular to building lines and wherever possible shall be grouped together for easy service and identification. Whenever possible, horizontal and vertical runs shall be held as close as possible to the walls, ceilings, struts, members, etc., so as to occupy the minimum space consistent with the proper installation requirements for insulation, conduit, ductwork, lighting fixtures, etc., and the expansion requirements of each of these items and the building proper or the removal of the respective or adjacent pipes, conduits, and ductwork, and to allow for necessary access to valves, other pipes, conduits, dampers, etc.

3.2 CROSS CONNECTION AND INTERCONNECTIONS

A. No plumbing fixtures, device, or piping shall be installed which will provide a cross connection or interconnection between a distributing water supply for drinking or domestic purposes and a polluted supply such as drainage system, or a soil or waste pipe which will permit or make possible the backflow of sewage, polluted water, or waste into the water supply system.

3.3 FLASHINGS

A. Flash around all pipes passing through the roof with sheet lead, built a minimum of 10" into the roofing, in all directions from the outside of the pipe running up the pipe a minimum of 10" and more where vent terminals must be higher to conform to the requirements of the local Plumbing Code in effect, and then turned over one inch (1") into the pipe cavity. All seams and joints shall be completely soldered closed and the entire flashing shall be completely waterproof.

B. Make all roof penetrations in accordance with the roofing system manufacturers approved methods.

3.4 PIPE INSULATION INSERTS AND SHIELDS

A. Provide a section of Foamglas insulation, calcium silicate, or urethane of thickness specified at hanger support locations and provide No. 16 gauge galvanized steel protection shield minimum 12" long. Shield shall be full half cylinders equal to Grinnell Fig. 167.

B. Refer to Section 23 07 00, Insulation.

3.5 SAFETY GUARDS

A. Furnish and install all safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction.

B. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

3.6 TESTING AND REPAIRING

A. During the progress of each portion of the work or upon its completion, make such tests of this work as herein specified, or as required by the Architect, or by State or Municipal Bureaus having jurisdiction and under their supervision.

B. Provide all apparatus, temporary piping connections, or any other requirements necessary for such tests. Take all due precautions to prevent damage to the building and its contents incurred by such tests as will be required to repair and make good, at no cost to the Owner, any damage so caused. Testing of piping to be insulated shall be done before insulation is applied.

C. Perform any other tests as may be required by the Owner's Representative to indicate the fulfillment of specification requirements.

D. All water piping shall be hydrostatically tested to a pressure of 150 psig or to 1-1/2 times the operating pressure, whichever is the greatest, for six (6) hours.

E. Systems shall be tested in portions as required by the construction schedule and the portions being tested shall be effectively isolated and sealed off. When previously tested sections are connected into other sections, tests shall be rerun to include the new connections.

F. Partial systems shall be tested prior to connecting into existing lines.

G. Leaks in screwed joints shall be repaired by tightening the joint until the leak has stopped, or by remaking the joint if tightening fails to stop the leak. Leaks in welded joints shall be repaired by chipping out the weld around the leak and rewelding until it is stopped. Leaks in caulked joints shall be completely stopped by additional caulking of the joint, but, if that fails, the joint shall be re-made. A leak in a compression joint shall be repaired by remaking the joint using a new seal, compression ring, coupling, etc., as required. Leaks in soldered joints shall be repaired by remaking the joint and no soldering or brazing over existing joints will be permitted. Any defective piping shall be replaced.

H. Additional testing shall be as specified in the individual Sections of these Specifications.

I. During testing and cleaning of piping systems, use a fine mesh, 20 mesh or smaller, start-up strainer screen for all strainer pipe sizes. After piping system is cleaned each strainer shall be taken apart, cleaned, and final strainer mesh shall be placed back in strainer for normal operating conditions.

3.7 SEALING PENETRATIONS

A. Seal all pipe and duct penetrations through walls run to structure, ceilings, floors and roofs. Fill the annular space between the insulation on the pipe, or the pipe only where uninsulated, or duct and its sleeve, with neoprene or non-hardening sealant.

B. No pipe or duct shall be allowed to contact its surrounding sleeve or the wall, floor, or ceiling. Effective isolation shall be provided as described in Section 23 05 48 to the end that no vibration or direct noise transmission shall be transmitted. Vibration transmission limits shall be as established in Section 23 05 48. Use special materials as may be required to comply.

C. Firestop pipe and duct floor and wall penetrations.

3.8 PAINTING

A. All equipment specified in Division 23 shall be delivered to the site with suitable factory finishes as specified elsewhere herein.

B. Items with factory applied finishes shall be protected during installation and other construction work. Damaged factory applied finishes shall be refinished to match the original finish appearance.

C. Field painting of items specified and installed in Division 23 shall be as specified in Section 09 9000.

D. All ferrous metals that are not galvanized or made of a corrosion resistant alloy shall be painted. This shall include steel pipe hangars, trapeze supports, pipe stands, all thread hangar rods and other miscellaneous systems.

END OF SECTION

SECTION 23 30 00

HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

A. The scope shall include the furnishing and installation of all ductwork as shown on the Drawings; acoustical and thermal linings; flexible ducts and connections; combination smoke and fire dampers, smoke dampers, and fire dampers; duct access doors; air diffusers, grilles and registers; air volume control devices; hangers and supports; plenums and casings; turning vanes; air filters; installation of temperature control dampers, and other appurtenances necessary for a complete and operational system.

B. All work shall be preceded by taking measurements at the job site, fully coordinating all work with other trades, verifying available spaces for ductwork, and developing Shop Drawings illustrating such.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the quality as specified herein. All work shall comply with the most recent Local Building Code, Mechanical Code, Fire Code, and all other applicable National, State and Local Codes or ordinances.

B. All equipment and materials shall be installed in a workmanlike manner by trained and experienced sheet metal technicians and mechanics as recommended by the manufacturers of the products installed.

C. Where the standards and requirements of this specification exceed those of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) the requirements herein shall govern. As a minimum all ductwork shall be constructed to meet all functional criteria defined in Section 11 of the 2005 SMACNA “HVAC Duct Construction Standards, Metal and Flexible,” Third Edition. However, all ductwork shall comply with all code requirements noted above to include meeting deflection limits established in the local Mechanical code.

D. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job, "Substantial Completion", against noise, chatter, whistling, or vibration, and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner's Representative.

E. Air quantities shown on the Drawings, or specified, are based on air at 75 Deg.F. dry bulb, 50 percent relative humidity, and 29.92 inches H.G. barometric pressure.

F. Except where specified otherwise, all sheet metal used shall be constructed from prime galvanized steel sheets or coils up to 60 inches in width. Each sheet shall be stenciled with manufacturer’s name and gauge. Coils of sheet steel shall be stenciled throughout on 10 foot centers (fabricate with stencils to the outside of the ductwork so they are visible when installed) with manufacturer’s name and gauge tolerances in inches:

Gauge No.	Nominal Thickness	Minimum Thickness
26	0.0217	0.0187
24	0.0276	0.0236
22	0.0336	0.0296
20	0.0396	0.0356
18	0.0516	0.0466

G. Contractor shall comply with this specification section in its entirety. If during a field observation, the engineer of record finds changes have been made without prior written approval, the contractor shall make the applicable changes to comply with this specification at the contractor's expense.

H. At the discretion of the Engineer of Record, sheet metal gauges and reinforcing may be randomly checked to verify all duct construction is in compliance with this is specification section.

I. All ductwork and fittings shall have a computer generated label affixed to each section detailing all applicable information including the duct dimensions, gage, reinforcement type/class, and connector type of the systems manufacturer. In addition, galvanizing thickness and country of origin shall be clearly stenciled on each duct section.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions in all items specified herein in accordance with Section 23 05 00.

B. Shop Drawings shall be submitted on all items of sheet metal work specified herein. Shop drawings of ductwork shall be submitted at a minimum scale of 1/4" equal to one foot except that the Congested Areas and all Air Handling Unit Mechanical Rooms shall be submitted at a minimum scale of 1/2" = 1'-0". Provide sections for all Congested Areas and Mechanical Room Plans.

C. Shop Drawings shall include the reflected ceiling plan, screened back, overlaid onto the floor plan indicating the proposed installation of all light fixtures; ductwork layout; duct fittings; duct connection details; offsets; bottom of duct elevations; all sheet metal dimensions (sizes); overall air device sizes, air device neck sizes, air device air flow quantities, and device type; duct pressure classifications; all mechanical piping; any conflicts discovered and unresolved through the use of transitions and offsets in the available space; turning vanes; manual volume dampers; automatic control dampers; smoke and fire dampers; duct access doors; flexible connections; and all mechanical fans and equipment.

D. Sheet metal shop drawings shall be overlaid on piping shop drawings and other shop drawings for other portions of work specified in other sections of these specifications for complete coordination of all work prior to commencing with any installation. These Shop Drawings shall not be prepared directly on the Shop Drawings of other trades; they will be separate from all other shop drawings. Coordination Drawings shall be prepared in accordance with Specification Sections 01 33 23.

E. Shop Drawings shall be based on actual field measurements taken at the job site and shall take into consideration all obstacles and be fully coordinated with all piping, conduits, structure, equipment, and general construction features.

F. Shop Drawings shall be generated by a computer aided design and drafting (CADD) system as a CADD drawing. CADD files with Architectural Backgrounds and Mechanical design drawing files will only be provided when requested, if this privilege has not been previously abused, after a Release of Liability Form has been completed.

G. Include a brochure, with individually assembled cut sheets, and details of all sheet metal fittings, duct construction standards proposed for each system, air volume control devices, and other accessories proposed to be used for job duct construction standards. This shall be done prior to submission or preparation of any sheet metal shop drawings.

H. Should any ductwork installation commence without approved ductwork shop drawings or written approval by the Engineer of Record, the Contractor assumes all liability, to include all costs, in revising any portion of the sheet metal work that is deemed unacceptable by the Owner's Representative to include any conflicts discovered in installation that could have been resolved through the Shop Drawing process.

1.5 GUARANTEE

A. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job, “Substantial Completion”, against noise, chatter, whistling, or vibration, and be free from pulsation under all conditions of operation. This guarantee shall include defects in material, equipment and workmanship.

B. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner’s Representative. This shall include repair of damages to building materials related to these deficiencies.

1.6 PRODUCT HANDLING

A. Cover and protect material in transit and at site. Material not properly protected and stored, which has been damaged or defaced, or which has gotten wet during storage or construction shall be rejected.

B. Prior to ductwork being installed the roof system, or floor above the ductwork, must be sufficiently installed to protect ductwork from rain water entering ductwork. If the building is not dried-in and walls, windows, etc., are not completed, then cover all openings in ducts with securely fastened heavy duty, minimum three (3) mil thick, plastic to protect from rain damage.

C. Storage and protection of materials shall be in accordance with Section 23 05 00.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. General:

1. All ductwork shown on the Drawings, specified or required for the heating, ventilating, and air conditioning systems, shall be constructed and erected in a first-class workmanlike manner by trained and skilled sheet metal workers.
2. All ducts shall be erected in the general locations shown on the Drawings, but must conform to all structural and finish conditions of the building. Before fabricating any ductwork, Contractor shall check the physical conditions of the job site, and shall make all necessary changes in cross sections, offsets, etc., whether they are specifically indicated or not.
3. Before starting shop drawings or fabrication of any ductwork, the Contractor must have an approved reflected ceiling plan with which he can coordinate location of air outlets, lights, tile patterns, etc.
4. The sizes of ducts indicated on the Drawings are the required net internal air stream dimensions, and where ducts are lined, the sheet metal sizes shall be increased three inches (3") in both dimensions to accommodate the linings (1-1/2" thick lining, unless indicated otherwise). Assume all rectangular ducts are lined unless noted otherwise.
5. Ductwork shall be classified, for construction standards, as follows:

    a. All exhaust ductwork, except grease or other special exhaust systems specified elsewhere herein, all constant volume ductwork (supply and return) served by packaged rooftop units, split direct expansion (supply, return and outside air) A/C units, all ductwork served by fan coil units, and all transfer air ducts shall be constructed to meet one inch (1") W.G. standards.

6. Except as noted otherwise, ducts, plenums, and casings shall be constructed of new lock forming quality galvanized prime grade steel sheets. The gauges of metal to be used, duct construction details, and the construction and bracing of joints shall be in accordance with the latest edition of the published standards of the ASHRAE Handbook or in accordance with the latest editions of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "Duct Construction Standards Manual, Metal and Flexible".
7. Plenum chambers shall be constructed of 18 gauge sheets thoroughly braced with 1-1/2 inch angle irons. All duct panels in rectangular galvanized steel ducts which are 12 inches and wider and which are not lined shall be cross broken.
8. Make square elbows where shown or required, with factory fabricated double thickness turning vanes. Job fabricated vanes will not be acceptable. Except as otherwise specified or indicated on the drawings, make all other changes in direction with rounded elbows having a centerline radius equal to 1-1/2 times the width of the duct in the plane of the bend.
9. Make transformations in duct shape or dimension with gradual slopes on all sides. Normally, make increases in dimension in the direction of air flow, with a maximum slope of one inch (1") in seven inches (7") on any side. Where conditions prevent the normal slope specified above, a maximum slope of one inch (1") in four inches (4") will be allowed only where conditions necessitate.
10. Where a transition must be made with less slope than that noted above, install single thickness guide vanes to insure proper air flow, and to minimize air pressure drop. Transitions that require less slope than that noted above shall be noted on Shop Drawings, and require review and approval by the Engineer prior to installation.
11. Ducts shall be routed in conjunction with all types of pipes, electrical conduits, ceiling hangers, etc., so as to avoid interferences insofar as possible. When duct penetrations are unavoidable, provide streamline-shaped sleeves around such material penetrations, made airtight at duct surfaces, except that such sleeves are not required at tie rods. When the Contractor believes such penetrations are unavoidable, notify the Owner's Representative for approval prior to commencing with such work. Otherwise all such penetrations are not expected to occur and are not allowed. Such penetrations will not be allowed for the convenience of, or lack of coordination by, the Contractor. Where obstructions necessitate, are approved by the Owner's Representative, and are of a size exceeding 10% of the total duct area, the duct shall be transformed to maintain the same original duct area.
12. Where each duct passes through a fan room wall, it shall be wrapped with not less than 1/2" thick closed cell neoprene tightly fitted to the outer surface of the duct all around and sealed. In lieu of this method, completely fill the annular space between the duct and penetration by packing with fibrous insulation and seal the perimeter of the penetration around the duct, on both sides of the penetration, with a flexible non-hardening sealant, to be fire rated when applicable.
13. All outlets or grilles in ceilings shall be supported rigidly from ceiling construction with suitable adapters or bucks installed as necessary and as shown to insure outlets and grilles will be accurately trued up with ceiling.
14. Ductwork shall be fabricated in a manner to prevent the seam or joints being cut for the installation of grilles or diffusers.
15. All sheet metal ductwork shall be securely hung from the building construction. All ducts shall be hung adjacent to the seam in the duct and shall be secured in a suitable manner to both the duct and the building construction. All vertical riser ducts shall be supported at each floor with angle iron secured to the ducts and set on the structure members. These angles shall be the same size as specified for bracing.
16. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time. All panels of uninsulated ducts twelve inches (12") and larger shall be cross broken. In general, sheet metal screws shall not be used in duct construction unless the point of the screw is in the air stream unless specifically indicated otherwise elsewhere herein.
17. Manual dampers shall be installed as shown on the Drawings and as required to afford complete control of the air flow in the various duct systems. In rectangular supply ducts, a splitter damper shall be installed at each point where a branch is taken off and additional volume dampers shall be installed where shown or required to achieve the final air balance. No splitter dampers shall be installed in medium pressure ductwork, unless specifically shown on Drawings.

18. Splitter dampers and volume dampers of the "butterfly" type, installed in rectangular ducts, shall be constructed of 16 gauge galvanized steel riveted or welded to square operating rods. Dampers shall have brass, bronze, or approved plastic bearings. The length of any splitter damper blade shall be 1-1/2 times the width of the smaller split in the duct, but shall be not less than twelve inches (12"). Where splitter dampers exceed 12 inches in height two (2) pull rods shall be used. Splitter dampers 12 inches (12") in height or less shall have one (1) pull rod.
19. Butterfly damper blades in round ducts shall be the full width of the duct in which they are installed. Dampers shall be constructed of a minimum 22 gauge metal. Dampers over twelve inches (12") in diameter shall be constructed of 20 gauge metal, have a continuous rod with end bearings opposite the damper handle, and a quadrant type locking handle.
20. The operating rods of all dampers shall be fitted with Young Regulators and the operating head shall be securely fastened in place so as to be accessible in the finished building unless shown otherwise. Operators shall be attached to duct where regulator occurs above a lay-in ceiling. Use a Ventlok No. 555 locking quadrant on accessible concealed splitter dampers. Where locking quadrants are installed on externally insulated ductwork a hat channel extension shall be used to match the same height as the insulation thickness. Where dampers occur above or behind plaster or other inaccessible ceilings, walls, chases or furrings, the regulator shall be the concealed type with adjustable cover plate equal to Young Regulator Company Type 315 with maximum 2-1/2" diameter cover plate and required accessories. Young Regulator bearings shall also be provided on the opposite end of each operating rod.
21. Behind each ceiling supply outlet, provide and install a turning vane or approved equalizing grid, where noted or scheduled. Where adjustable air pick-ups are indicated at points branch ducts meet trunk ducts, they shall be Titus AG-45 or approved equal with operator adjustable from the duct exterior.
22. Rectangular opposed blade volume dampers shall be as manufactured by American Warming and Ventilating or Ruskin. Blades shall not exceed 48 inches in length or twelve inches (12") in width, and shall be the opposed interlocking blade type. The blades shall be of not less than No. 16 gauge steel supported on one-half inch (1/2") diameter rustproofed axles. Axle bearings shall be the self-lubricating ferrule type.

B. Low Pressure Ductwork:

1. Rectangular low pressure ducts, systems designated to be operating at up to two (2) inches W.G., shall be constructed of the following medium gauges:

Largest Dimension of Duct	U.S. Gauge of Metal	Maximum Reinforcement Spacing
Up to 26"	26	5'-0"
27" to 42"	24	4'-0"
43" to 48"	22	4'-0"
49" to 60"	20	4'-0"
61" to 84"	18	4'-0"
85" to 96"	18	3'-0"
97" and Over	18	2'-6"

C. The above rectangular ducts shall be constructed in accordance with Section 1 the latest edition of the "Duct Manual" published by the Sheet Metal and Air Conditioning Contractors National Association. However, the gauge thickness of the ductwork shall meet that as scheduled above.

1. Rectangular low pressure ducts, for systems designated to be operating at up to one (1) inches W.G., shall be constructed of the following medium gauges:

Largest Dimension of Duct	U.S. Gauge of Metal	Maximum Reinforcement Spacing
Up to 36"	26	5'-0"
37" to 48"	24	5'-0"
49" to 60"	24	4'-0"
61" to 72"	22	4'-0"
73" to 84"	20	4'-0"
85" to 96"	18	4'-0"
Over 96"	18	2'-6"

2. The above rectangular ducts shall be constructed in accordance with Section 1 the latest edition of the "Duct Manual" published by the Sheet Metal and Air Conditioning Contractors National Association. However, the gauge thickness of the ductwork shall meet that as scheduled above.
3. Round low pressure ducts shall be spiral wound as manufactured by United Sheet Metal Company or have grooved seams with flat snaplock longitudinal seams. Spiral seam round duct gauge thicknesses shall be that standard by the manufacturer for the pressure rating of the system. Gauges for snaplock shop fabricated ducts shall be as follows, without exception:

Largest Dimension of Duct	Gauge of Metal	Gauge of Longitudinal Seams and Fittings
Up thru 8" in Diameter	26	26
9" to 14"	26	24
15" to 26"	24	22
27" to 36"	22	20
37" to 50"	20	18
51" to 60"	18	16

4. Elbows shall have a centerline radius of 1-1/2 times duct diameter or width and for round ducts may be smooth elbows or 5 piece 90 degree elbows and 3 piece 45 degree elbows. Joints of round ducts shall be slip type with a minimum of three (3) sheet metal screws.
5. All low pressure ductwork shall be externally sealed using water based products to include, United McGill Corporation United Duct Sealer, Hardcast "Iron-Grip 601", Childers CP-146, Foster 32-18 or Polymer Adhesive Sealant Systems, Inc. "Air Seal No. 11" duct sealer installed in the joints after closure. All sealants shall be U.L. rated for the application. Seal all external transverse joints, longitudinal seams, and all fitting connections externally to include sealing all duct work accessories, connections to accessories and duct and accessory penetrations (tubes, rods, wires, etc.). Do not seal control rods for actuated dampers and fasteners. Each system shall meet a seal class of “A”.
6. Low Pressure Duct Supports:
    a. All horizontal ducts up to and including 40 inches in their greater dimension shall be supported by means of No. 18 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets or clamps, and fastened above to inserts, toggle bolts, beam clamps or other approved means. Duct shall have at least one pair of supports 8'-0" on centers. Clamps shall be used to fasten hangers to reinforcing on sealed ducts.
    b. Horizontal ducts larger than 40 inches in their greatest dimension shall be supported by means of hanger rods bolted to angle iron trapeze hangers. Duct shall have at least one pair of supports 8'-0" on centers according to the following:

Angle Length	Angle	Rod Diameter
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
8'-0"	2" x 2" x 1/8"	5/16"
10'-0"	3" x 3" x 1/8"	3/8"

c. Vertical ducts shall be supported where they pass through the floor line with 1-1/2" X 1-1/2" X 1/4" angles for ducts up to 60". Above 60" the angles must be increased in strength and sized on an individual basis considering space requirements.

7. All low pressure ductwork shall be reinforced to maintain a maximum reinforcement spacing as scheduled with the rigidity classification as needed to meet the specification construction standard. Reinforcement spacing shall be reduced as required to meet the construction standard specified using the gauge thickness scheduled.

D. Round Flexible Insulated Ductwork:

1. All round flexible insulated ducts, low and high pressure type, shall be factory fabricated and insulated as manufactured by Thermaflex or Flexmaster USA, Inc. Flexible ducts shall be equal to Thermaflex factory insulated type "M-KC" or Flexmaster “Type 3M”.
2. Flexible duct thermal conductance shall be based on a 75 Deg. F. mean temperature and an aged condition (not out of the box value). Flexible duct insulation shall be a minimum nominal two inches (2.0") in thickness with a minimum 0.75 lb. density. The completed duct assembly shall have a minimum R-value of 6.0. To verify compliance with the Energy Conservation Code in effect, the minimum R-value of 6.0 will need to be documented on the outside of the jacket to allow field verification of compliance with this requirement.
3. The core liner of the flexible duct system shall be a tri-laminate aluminum foil, made with fiberglass and aluminized polyester, or a PVC coated fiberglass cloth. The outer liner shall be a polyester reinforced aluminized foil jacket.
4. Flexible ducts shall be U.L. Listed in accordance with U.L. 181 as a Class I insulated air duct, and shall comply with NFPA Standard 90A and 90B. Flexible ducts shall have a maximum flame spread of 25 and maximum smoke developed rating of 50.
5. Flexible ducts shall be suitable for operating temperatures of -20 up to 250 Deg. F.
6. Flexible ducts shall be suitable for negative pressures of minus one inch W.G. in sizes up to 16" in diameter; and positive pressures up to 10 inches W.G. for sizes up to 16" in diameter. Maximum operating duct velocity rating shall be a minimum of 4,500-5,500 feet per minute.
7. Maximum vapor transmission rating shall be 0.05 Perms as rated in accordance with ASTM-E-96.
8. Unless otherwise noted, the maximum length of flexible duct shall be limited to five feet (5').
9. Securement of flexible ducts to air devices shall consist of sliding the duct onto the air device collar or connector and securing it with plenum rated nylon or teflon panduit band on the inner liner which shall be U.L rated for the application. Fold insulated outer vapor barrier jacket liner over the first band and secure with a second plenum rated panduit band. Make connection vapor tight with a vapor barrier seal using polyester reinforced aluminized duct tape that is two inches (2") wide, wrapped 2 times around the duct, or by the use of a fiberglass mesh wrapped in a similar fashion and coated with a vapor barrier coating, Foster’s Vapor Safe 95-90 or 95-96 mastic or Childers CP-38. Coating must adhere to MIL-PRF-19565C with a permeance rating of less than 0.02 perms per ASTM-E-96, procedure B. No cloth backed duct tape is allowed. All fasteners, adhesives, and duct tape used shall be U.L. rated for the application. All duct tapes used shall be acrylic based.

2.2 FIRE, SMOKE, AND COMBINATION SMOKE-FIRE DAMPERS

A. Contractor shall furnish and install fire, smoke, and combination smoke-fire dampers in air passages, openings, and ductwork wherever shown on the Drawings, and as required by the local authorities having jurisdiction. Installations shall be in accordance with all applicable NFPA standards and the SMACNA Duct Manual. All dampers shall carry the U.L. Label and shall be installed such as to conform to conditions under which the U.L. Label was granted. All dampers shall be constructed and tested in

accordance with the latest edition of U.L. Safety Standards 555 or 555S, as applicable. Provide sleeves, typically 12" in length minimum, for all dampers as required for the installation conditions encountered.

B. Fire dampers shall be constructed in accordance with the recommendations of the NFPA and shall be of metal gauges required by the class of separation in each case.

1. Interlocking curtain blade type fire dampers carrying the Underwriters' Label will be acceptable, except at locations where an operating type damper is required to meet local requirements, to meet sequence of operations indicated in Temperature Control Specifications, Section 23 0900, or to meet the limited spaces available.
2. Use Style "B" rectangular and style "CR" for round dampers such that blades are out of the air stream.
3. For grille installations at fire rated partitions, use Style "B" thin line fire dampers or Style "G" integral sleeve type for grilles.

C. Smoke dampers shall be designed for vertical or horizontal applications as encountered in accordance with NFPA 90A and meet the latest requirements of UL 555 S. Smoke dampers shall be installed in, or adjacent to, the smoke barrier; but in no case, more than 24 inches from the smoke barrier. Smoke dampers shall be a Ruskin Model SD35, 36, 37, or SDRS25 as applicable for the application. Frames shall be made of 16 gauge single piece galvanized steel hat shaped channel frames. Blades shall be 6" wide galvanized steel and be the triple V-groove or air foil type. Provide stainless steel jamb seals, silicone edge type blade seals where required for the classification, stainless steel sleeve bearings and linkages concealed in the frame. Leakage Class shall be Class 1, 2, or 3, as required, to meet the requirements specified elsewhere herein. Provide compatible electric actuator on all dampers, factory installed.

D. Combination fire-smoke dampers shall be Leakage Class 1 dampers with electric, manually resettable, fuse link operated by 120 volt electric actuator furnished with the damper. Fire-smoke dampers shall be Ruskin FSD-60, or equal, with minimum 16 gauge galvanized steel hat channel shaped frames. Fire-smoke dampers shall be increased in size to maintain a minimum of 90 percent free area of the ductwork size indicated on the Drawings thru each fire-smoke damper. Leakage shall be Class 1, 2, or 3, as required, to meet the requirements specified elsewhere herein. Provide compatible electric actuator on all dampers, factory installed.

E. Insulated all metal access panels, secured with sash locks, shall be installed to service all fire, smoke, and combination smoke-fire dampers. Access panels shall be identified with "FIRE DAMPER", “SMOKE DAMPER”, or "SMOKE-FIRE DAMPER" stenciled thereon in a visible or conspicuous location. Removable flexible duct shall not be permitted as a means of damper access. Access shall be direct and shall not be obstructed by turning vanes or other duct accessories.

F. General Requirements:

1. For “Ductmate” connections at fire, smoke, or combination smoke-fire dampers, do not use screw fasteners.
2. Use four inch (4") draw band connections at round duct fire damper connections.
3. Use blade dampers when the blade width exceeds 12 inches.
4. Install vertical or horizontal mount dampers suitable for the application.
5. Dampers shall be suitable for the maximum air system operating pressures expected to be encountered. Medium pressure ductwork is expected to operate at up to six inches (6") W.G.
6. Use multi-section dampers where damper size openings are larger than single section maximum sizes.
7. Fire, smoke and combination smoke-fire dampers shall be sized to provide for 100 percent of the ductwork size (minimum 95% free area) indicated on the Drawings through each damper.
8. Provide 165 Deg. F. rated fusible links for fire dampers.

G. Acceptable Manufacturers:

1. Ruskin, or approved equals by:
2. Greenheck, or
3. Nailor, or

4. Prefco, or
5. National Controlled Air (N.C.A.), or
6. Air Balance, or
7. Pottoroff.

2.3 FLEXIBLE CONNECTIONS

A. Where ducts connect to fans, including roof exhausters, flexible connectors shall be made that are fire-resistant, (up to 200 Deg. F.), waterproof, mildew-resistant and essentially airtight, and shall weigh approximately thirty ounces (30 oz.) per square yard.

B. There shall be a minimum of one-half inch (1/2") slack in these connections, and a minimum of two and one-half inches (2-1/2") distance between the edges of the ducts for a total of three inches (3"). There shall also be a minimum of one inch (1") of slack for each inch of external static pressure on the fan system for medium pressure systems.

C. Acceptable Manufacturers:

1. Vent Fabrics "Ventglas", or approved equals by:
2. Duro-Dyne.

2.4 ACCESS DOORS

A. Furnish and install hinged, low leakage access doors in ductwork or plenums to provide access to all fire, smoke and combination fire - smoke dampers, mixed air plenums, automatic dampers, coils, filters, and elsewhere as detailed on the Drawings.

B. Where the ducts are insulated, the access doors shall be double skin doors with a minimum one inch (1") of insulation in the door. The insulation shall have a minimum R-value of 5.0. Increase the thickness of the insulation as needed to comply. Where the access door is installed in non-insulated ductwork the access door shall be unlined sheet metal of the same gauge thickness as the duct.

C. In no case shall access doors be smaller than eight (8") by eight inches (8"). Access doors shall be sized to permit testing or servicing of duct mounted components, such as, for coil cleaning, installation of control devices, resetting of fusible links, filter replacement, etc., as applicable and suitable for the application.

D. Where duct access doors are above a suspended, normally non-readily accessible ceiling, such as plaster, gypsum board or spline type ceilings, Contractor, under this Section of Specifications, shall be responsible for the proper location, and furnishing of, ceiling access doors, or panels, to make duct access doors easily accessed through the ceiling system. Ceiling access doors, or panels, shall be rated, where applicable, to match the fire rating of the ceiling system penetrated. Ceiling access doors, or panels, shall be installed under other Sections of these Specifications. Ceiling access doors, or panels, shall be centered directly beneath duct access doors or immediately adjacent thereto when duct access is through the side of the duct.

E. All access doors shall be fully double gasketed, door to frame and frame to duct, and include a sash type or compression latches for sizes under eighteen inches (18") by eighteen inches (18"). Use one (1) sash type latch per twelve inches (12") of height or width. Access doors 18" x 18" and larger shall have quarter turn handle latches. Provide one handle per 24" section, height or width, of door. As an example, provide two (2) handle type latches for a 48" tall access door.

F. Provide a minimum of two (2) heavy loose pin hinges for each access door unless indicated otherwise herein. Piano style hinges will be an allowed substitute.

G. Where the installation conditions prohibit suitable access with hinged access doors, then non-hinged access doors may be used in conjunction with a corrosion resistant cable or chain, of suitable length, attached to the access door and duct.

H. For duct systems constructed to 2 inches W.G standards, or less, provide standard access doors meeting all requirements specified herein, which have a tested air leakage rating of less than 4.0 CFM at a test pressure of 2 inches W.G., and as manufactured by:

1. Ventlok with hinges and No. 90 or No. 99 latches (less than 18" x 18"), or No. 100 or No. 140 latches (18" x 18" and larger), as applicable, or approved equals by:
2. Ductmate, or
3. Duro Dyne DDIAD-0806, or
4. NCA Manufacturing ADH-T-1, or
5. Pottorff HAD or CAD, or
6. Nailor 08SH with HP Seal, or 0890, or
7. Cesco Products HDG, or
8. Ward Sandwich Style Access Doors, DSA or DDA, for round ductwork.

I. For duct systems constructed over 2 inches W.G., up to 6 inches W.G. standards, provide high pressure low leakage access doors meeting all requirements specified herein, which have a tested air leakage rating of less than 1.0 CFM at a test pressure of 6.0 Inches W.G. and as manufactured by:

1. Ventlok similar to that noted above, or their Twist-In Door (insulated), or approved equals by:
2. Ductmate “Sandwich” (Rectangular ducts), or Ductmate “Metu” (Round ducts), or
3. Ward Duct Connector Industries Type ‘F’ (Rectangular ducts) or Type ‘R’ (Round Ducts), or
4. Nailor 0820-1 or 0895, or
5. Pottoroff OAD.

2.5 TURNING VANES

A. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct.

B. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vanes shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer’s instructions.

C. Rails for mounting vanes shall have self-locking, friction fit tabs designed to facilitate proper alignment of vanes. Tab spacing shall be as specified in Figure 4-3 of the 2005 SMACNA Manual, “HVAC Duct Construction Standards, Metal & Flexible”, Third Edition standard. Rail systems with non-compliant tab spacing shall not be accepted.

D. Acoustical Turning Vanes shall be used in applications that require quiet operating systems. Mounting rails shall have friction insert tabs that align the vanes automatically. These shall only be required where designated on the Drawings.

E. Approved Manufacturers:

1. Ductmate Industries PRO-Rail Turning Vane or approved equals.

2.6 DUCT LINER

A. Where indicated on the Drawings or specified herein, all rectangular ducts; except kitchen grease hood, kitchen dishwasher and fume hood exhaust ducts; shall be lined with Fiberglass mat faced duct liner in the thicknesses, type, and locations as indicated elsewhere herein.

B. Kitchen grease hood exhaust, kitchen dishwasher exhaust, kitchen hood make-up air, and fume hood make-up air and other industrial type exhaust air ducts shall not be lined. Line all other general building exhaust air ducts within 10'-0" on each side of each in-line exhaust fan with one inch (1") thick liner. Roof mounted exhaust fan ductwork shall also be lined, one inch (1") thickness, but only for the first 10'-0" of ductwork from the roof curb toward the occupied space.

C. All return, transfer, and relief air ducts shall be lined with one inch (1") thick duct liner for the first 10’-0” from the unit.

D. The liner insulation system shall be one and one-half inches (1.5") in thickness for the first 10'-0" from the unit, on all conditioned air, heated or cooled, as well as outside air intake ducts, and mixed air plenums to obtain a minimum R-value of 6.0 thereon.

E. All sound sensitive areas shall be lined with two inch (2") thick duct liner.

F. All ductwork systems are required to meet the most recent version of the International Energy Conservation Code.

G. All duct liners shall comply with NFPA 90A and 90B and ASTM C 1071, Type I, for ducts and Type II for plenums (rigid liner). Liner shall consist of flexible, matt faced insulation made of inorganic glass fibers bonded by a thermosetting resin with an encapsulant edge coating, and shall be a rotary style duct liner product with a water repellant ingredient on the mat face to help keep moisture from penetrating the air stream surface. Other technical requirements shall include:

1. Be suitable for temperatures up to 250 Deg. F. per ASTM C 411.
2. Be suitable for air velocities up to 6,000 FPM per ASTM C 1071 for Type I products and 5000 FPM for Type II products.
3. Water vapor sorption shall be less than 3% by weight per ASTM C 1104.
4. Air stream surface mat facing shall be tested with an EPA registered anti-microbial agent to aid in the prevention of fungal and bacterial growth. Mat face, as treated, shall not support the growth of mold, fungi, or bacteria per ASTM C 1338, ASTM G 21 and ASTM G 22.
5. Does not exceed a Flame Spread of 25 and Smoke Developed and Fuel Contributed of 50 per ASTM E 84, NFPA 225, and UL 723.
6. Conductance of 0.24 (R-value of 4.2) for a 1.5 PCF or 2.0 PCF duct liner at a 75 Deg. F. mean temperature per ASTM C177 for a one inch (1") thick product.
7. Greenguard Compliant (Greenguard Environmental Institute).
8. Noise Reduction Coefficient (NRC) of 0.70 or higher for a one inch (1") thick product and 0.80 for a two inch (2") thick product per ASTM C 423, type A mounting.

H. All duct liners shall be able to be cleaned in accordance with the North American Insulation Manufacturers Association (NAIMA) "Cleaning Fibrous Glass Insulated Air Duct Systems Recommended Practices".

I. Liner shall be applied to the inside of rectangular ducts and plenums with fire-resistant adhesive, Fosters 85-60, 85-65, or Childers CP-127, Hardcast "Seal-Tack" or Ward "Premium Duct Liner Adhesive", or approved equals only, complying with ASTM C 916, completely coating the clean sheet metal. All uncut joints in the insulation shall be "buttered" and firmly butted tightly to the adjoining uncut liner using the same fire resistant adhesive.

J. Where a cut is made in the insulation for duct taps, etc., the "raw" edge shall be accurately and evenly cut and shall be thoroughly coated with a water based fire resistant adhesive. Where tears in the insulation occur coat such with the same adhesive (duct liner protective coating). Adhesives shall be Design Polymerics Duct liner Protective Coating (2510/2515/2540/2545), Ductmate Super Liner Seal (SLS), or approved equals only.

K. On ducts over twenty-four inches (24") in width or depth, the liner shall further be secured with mechanical fasteners. Fasteners shall be Graham or Gemco weld pins. "Stick Clips", "Sheet Metal Clips", or other fasteners secured to the ducts by adhesive are not allowed. Fasteners shall be placed on a maximum spacing of eighteen inches (18") and shall be pointed up with fire-resistant adhesive. Fasteners shall not compress the insulation more than 1/8".

L. Liner shall be accurately cut with all cut ends thoroughly coated with an approved liner edge coating adhesive so that when the duct section is installed, the liner shall make a firmly butted and tightly sealed joint. Provide metal nosings securely installed over transversely oriented liner edges facing the air stream at all fan discharges, at access doors, and at any interval of lined duct preceded by unlined duct. This adhesive type shall be Duro Dyne "Dyn-O-Coat", or equal. This shall be an aerosol which is quick drying, flexible and tack free. Treat all exposed edges, butt seams, and inadvertent tears.

M. Where rectangular ducts are lined and adjoins externally insulated rectangular ducts, the two insulations shall be overlapped not less than twenty-four inches (24").

N. Dimensions given on the Drawings are inside air stream, free area, dimensions only and sheet metal sizes shall be increased in size to maintain these free area dimensions when liner is installed.

O. All exposed ductwork shall be internally lined unless specifically indicated otherwise.

P. Refer to Section 23 07 00, Insulation, for further related requirements.

Q. Acceptable liner manufacturer shall be:

1. Certainteed, Tough Gard R with enhanced surface.
2. Knauf, Rotary Duct Liner E-M with Hydroshield.
3. Owens Corning, Quiet R Acoustic Duct Liner, Type 150 or equivalent Duct Liner Board.
4. Johns Manville, Linacoustic RC or R-300.

2.7 GRILLES, REGISTERS, AND DIFFUSERS

A. Grilles, registers, ceiling outlets, diffusers and other air devices shall be as scheduled on the Drawings and shall be suitable for the intended use.

B. Provide air devices with sponge rubber or soft felt gaskets at flanges where the devices mate up to a ceiling or wall surface.

C. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level or criteria, face velocity, throw, drop, pressure drop, air diffusion, etc., before the submittal is made. Selections shall meet the manufacturers' own published data for the above performance criteria. The throw shall be such that the terminal velocity will be not more than 50 FPM or less than 25 FPM at the point of penetrating the occupancy zone. The occupancy zone is defined as six feet (6') above the finished floor and six inches (6"), or farther, from the walls.

D. Noise levels shall not exceed those published in current ASHRAE Standards and Guidelines for the type of space being served (N.C. level) or that scheduled.

E. Locations of outlets on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be governed by the established pattern of the lighting fixtures, structure and Architectural Reflected Ceiling Plan (RCP). Air devices shall have margins, frames, and sizes to be compatible with the ceiling and wall systems installed. All color and finishes are subject to final approval by the Architect.

F. Where called for on the schedule, grilles, registers, ceiling outlets, diffusers and other air devices shall be provided with deflecting devices and manual dampers.

G. Where indicated on the Drawings, provide a fire rated blanket on the back side of steel ceiling mounted air devices (supply, return, exhaust, etc.).

H. Where indicated on the Drawings, provide an insulation blanket on the back side (all surface area) of ceiling mounted supply air devices to prevent condensation.

I. All air devices shall be the standard product of the manufacturer, subject to review by the Architect. Acceptable manufacturers are:

1. Titus, or approved equals only by:
2. Krueger.
3. Nailor.
4. Metal-Aire.
5. Carnes.
6. Price Industries.

2.8 LINED SPIRAL DUCT

A. Lined spiral duct shall be United McGill Acoustic-K27 duct or equivalent. Utilize duct-duct slip joint connector, conical reducing tees, and 5 gore elbows (60 Deg. and 90 Deg.) for offsets and end runs.

B. Inner duct liner shall be perforated 28 gauge galvanized steel with 1.5" thick [1.0" thick allowed if ductwork is exposed in a conditioned space], 1.5 pound density, fiberglass insulation sandwiched between it and the outer duct. The outer duct shall be spiral seam construction, and be a minimum of 24 gauge galvanized steel.

C. In lieu of the perforated steel and factory installed insulation liner, an extra heavy density liner, field installed, may be used as an equivalent to the 1.5" thick Johns Manville Spiracoustic Plus. This system shall have a minimum R-value of 5.0 at 75 Deg. F Mean Temperature, with a noise reduction coefficient of 0.80. The airstream surface shall be coated and be suitable for mechanical cleaning.

D. Externally seal all duct connections, transverse and longitudinal, with a sealant being listed and labeled in accordance the requirements of U.L. 181A or U.L. 181B such as Foster 32-19 duct sealant.

2.9 AIR FILTERS

A. Provide appropriately sized and number of air filters for each piece of individual air handling equipment to include, but not be limited to, the following:

1. Packaged Rooftop A/C Units.
2. Split DX A/C Units.
3. Elsewhere as required to protect air type heat exchangers, such as warm air furnaces, or coil surfaces, such as duct mounted direct expansion coils.

B. Medium efficiency air filters shall generally be two inches (2") thick, unless indicated otherwise and shall be the pleated media, disposable type, listed by Underwriters Laboratories as Class 2, with the following features:

1. Air filters shall be rated in accordance with the most recent version of ASHRAE Standards 52.1 and 52.2, test methods as indicated herein, and shall conform to Section 7.4 of ARI Standard 850.
2. Filter media enclosing frame shall be constructed of rigid, heavy duty, high wet-strength resistant, “beverage” board with diagonal support members on the air entering and air exiting sides. Expanded diamond grid media support, integral with frame, shall be chemically bonded to filter media at each pleat, to insure pleat spacing and stability. Pleated media shall be bonded to the inside of the frame to eliminate air bypass.
3. Filter media shall be high performance, non-woven, reinforced cotton-poly, synthetic blend fabric formed in a V-shape.
4. Filters shall have the following performance data:

THICKNESS	SQUARE FEET MEDIA AREA TO ONE SQUARE FOOT FACE AREA	MINIMUM PLEATS PER LINEAL FOOT	INITIAL AIR RESISTANCE (INCHES W.G.)	RESISTANCE BASED ON AIR FLOW OF
One Inch (1")	2.4	16	0.25 (350 FPM)	1400 CFM
Two Inch (2")	4.3	15	0.28 (500 FPM)	1500 CFM

5. Filters shall be suitable for operation with varying velocities of up to 500 feet per minute (FPM) for 2" filters and 350 FPM for 1" filters.
6. Filters shall have a minimum efficiency of 30% with an average arrestance of 90 to 92% minimum dust holding capacity which shall be no less than 170 grams as tested in accordance with ASHRAE Standard 52.1. Filters shall also have a MERV rating of 8 as tested in accordance with ASHRAE Standard 52.2-2007.
7. Acceptable Manufacturers:

a. Camfil Farr, Inc., Model Aeropleat IV, or approved equals by:
b. Environmental Filter Corporation.
c. Eco-Air.

C. All filters shall be standard sizes that are readily and locally available, in stock, through multiple over the counter sources without requiring special order. Standard acceptable sizes shall be 16" x 20" and 16" x 25".

2.10 ADHESIVES AND SEALANTS

A. All adhesives and sealants used on this project must have a Volatile Organic Compound (VOC) content less than that listed in the current South Coast Air Quality Management District (SCAQMD) Rule 1168, and all sealants and fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

B. All adhesives and sealants shall meet the most current Leadership in Energy and Environmental Design (LEED™) requirements.

2.11 FIBERGLASS DUCTBOARD

A. Fiberglass duct board of any type is not allowed on this project without exception.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all ductwork and equipment as indicated on the Drawings in full accordance with these specifications including foundations, hangers, supports, etc.

B. Seal all ductwork as specified, pressure test and repair leaks.

C. Install all air intake, relief and exhaust air hoods on continuous neoprene strips set level on top of wood nailers of the specified roof curbs. Hoods shall be secured at 8" O.C. to the curbs with corrosion resistant screws if not secured by other fasteners as specified. Flash and counterflash to prevent water leakage through the overall roofing system.

D. Install all duct mounted components such as heating coils, electric or water type, sound attenuators, air terminals, etc. in accordance with the manufacturer’s recommendations.

E. Should defects or installation deficiencies become apparent, or are observed, after the systems have been in operation, the deficient components shall be removed and replaced or reinforced as directed by the Owner's Representative.

3.2 CLEANING OF DUCT SYSTEMS

A. Before the grilles or diffusers are installed, all fans and air conditioning units shall be operated and all debris and foreign matter shall be removed from the ducts.

B. The air conditioning units shall be thoroughly cleaned, and the drain pans shall be thoroughly cleaned and flushed out with a hose; the filters shall be thoroughly cleaned and the grilles shall then be installed.

C. Insure all duct openings are capped and sealed during construction when additions are not being made.

3.3 AUTOMATIC CONTROL DAMPERS

A. Refer to Section 23 09 00, Controls and Instrumentation.

B. Install all temperature control modulating dampers under this section of the specifications, furnished in Section 23 09 00.

3.4 FILTERS

A. No air moving equipment may be operated at any time without filters being fully installed in equipment.

B. Provide a minimum of three (3) spare sets of two inch (2") thick, medium efficiency, pleated media filters for all air handling and fan coil units, as well as for filter return air grilles where scheduled, in addition to manufacturer furnished filters specified elsewhere herein. Where other sections of these specifications require one inch (1") thick filters, or other types of filters, provide spare sets of matching thickness and type.

C. Additionally replace filters during construction as directed by the Owner's Representative.

D. Install one (1) new complete set of filters, as directed by the Test and Balance (TAB) Firm, just prior to performance of TAB work.

E. Install one (1) new set of filters at "Substantial Completion" of the project.

F. Where the minimum number of filter sets are not used for the aforementioned purposes, provide the left over filters to the Owner for maintenance stock.

G. Document, in writing, when each filter change-out occurs.

END OF SECTION

SECTION 23 34 00

EXHAUST AND SUPPLY AIR FANS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with Division 1 - General Requirements and referenced documents.

B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

A. Provide exhaust fans of the type, rotational speed, and arrangement indicated.

B. Each fan shall be rated to deliver the capacity indicated in the tabulation on the Schedule against the external resistance of the system in which it operates.

C. Provide high efficiency motors as specified in Section 23 05 13 for motors one (1) horsepower and larger.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the best quality.

B. All equipment and materials shall be installed by experienced mechanics and as recommended by the fan manufacturer.

C. All fans shall bare the AMCA and U.L. Labels. Capacity ratings shall be based on tests performed in accordance with the latest version of AMCA Standard 210 and Publication 211.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions together with fan curves.

B. Shop Drawings: Submit in accordance with Section 23 05 00.

C. When equipment, other than specified, is proposed, the Contractor shall be completely responsible for electrical revisions necessitated. Submit listing of electrical feeder and conduit sizes, breaker sizes, and motor starter sizes for each item of equipment where motor sizes are required to be larger than specified to meet scheduled capacities.

1.5 PRODUCT HANDLING

A. Cover and protect fans in transit and at site. Fans not properly protected and stored and which are damaged or defaced during construction shall be rejected. Cover all openings to prevent entrance of dirt and debris until final connections are made.

B. Storage and protection of materials shall be in accordance with Section 23 00 00.

PART 2 - PRODUCTS

2.1 FANS - POWER ROOF VENTILATORS (PRV-DOME AND UPBLAST TYPE)

A. Fans shall be direct or belt-drive, down blast or up blast type, units as indicated, positively ventilated, permanently lubricated, have sealed motors and fan shafts with ball bearings. Belt drive units shall be complete with cast iron adjustable sheaves.

B. Provide centrifugal all aluminum fans with static and dynamic balance and with capacities as scheduled on drawings, all tested, approved, rated and bearing the AMCA Seal of Approval.

C. Provide all aluminum weatherproof housing, venturi throat inlet, bird screen and disconnect. Provide for concealed wiring such that power wiring does not penetrate roof but runs within curb.

D. Curbs shall be minimum twelve inches (12") high, made of galvanized steel and be insulated with minimum 1-1/2", 1-1/2 PCF density insulation, have continuous perimeter treated wood nailer and be furnished with a neoprene isolation strip to be placed on the top of the nailer. Provide sloped bottom of curbs to match roof pitch to allow for fans to be installed level.

E. Furnish automatic backdraft dampers for all fans, unless indicated otherwise. Only up blast grease exhaust models will not have backdraft dampers.

F. For kiln exhaust systems the exhaust fan and drive assembly shall be rated for a minimum of 300 Deg.F. The FloAire DU25H (Verify size on each project per fan schedule) has generally been pre-approved for typical kiln exhaust systems that are coupled with vent-a-kiln exhaust hoods. Submittal data shall confirm compliance with this requirement.

G. Provide SCR fan speed controller on direct drive motors with minimum stop for motor protection to be factory mounted on unit to be used for final air balance purposes.

H. Acceptable manufacturers:

1. Loren Cook.
2. Greenheck.
3. ACME.
4. Penn.
5. FloAire.
6. Twin City Fans and Blowers.

2.2 CEILING CABINET EXHAUST FAN

A. Provide in-line type ceiling cabinet exhaust fans with the capacities and characteristics scheduled.

B. Fans shall be AMCA certified and bear the label thereof.

C. Casing shall be made of galvanized steel and acoustically insulated for quiet operation. Housing shall be installed to provide for accessibility and removal of motor and blower without removing housing from the system.

D. Motors shall be permanently lubricated and have accessible internal wiring. Provide permanent split capacitor (PSC) motors. Provide external toggle disconnect switch with each fan.

E. Provide noiseless backdraft damper integral with unit.

F. Provide SCR fan speed controller with minimum stop for motor protection to be factory mounted on unit to be used for final air balance purposes.

G. Provide flat roof caps of the sizes indicated for each fan. Each cap shall be a minimum of eight inches (8") in diameter and shall be the curb mounted type to ensure proper flashing. Curbs shall be minimum

twelve inches (12") high, made of galvanized steel and be insulated with minimum 1-1/2", 1-1/2 PCF density insulation, have continuous perimeter treated wood nailer and be furnished with a neoprene isolation strip to be placed on the top of the nailer. Provide sloped bottom of curbs to match roof pitch to allow for roof caps to be installed level.

H. Acceptable manufacturers:

1. Loren Cook Gemini.
2. ACME Masterette.
3. Greenheck SP/CSP.
4. Penn Zephyr.
5. FloAire.
6. Twin City Fans and Blowers, T or TL series.

PART 3 - EXECUTION

3.1 DELIVERY AND PROTECTION

A. Deliver all equipment to the site as indicated in Division 1.

B. Contractor to perform installation and start-up to include installation of all accessories as required to make a complete and operating system.

C. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost to the Owner.

3.2 EXHAUST FANS - INSTALLATION

A. Install fans, suspended from structure, or as indicated, and provide vibration isolation internally or externally as required, as specified herein, or as specified in other sections of these specifications.

B. Suspended fans shall be set level with all thread rod from structure above.

C. For fans installed in wall sleeves secure fan to wall sleeve with non-ferrous corrosion resistant fasteners and seal watertight.

D. Field install motor and other accessories not factory installed.

E. Verify operation of automatic motorized and backdraft dampers.

F. Adjust fan drives and replace sheaves as required to obtain scheduled capacities as directed by the Test and Balance firm.

3.3 ROOF MOUNT CURBED EXHAUST FANS

A. Install all roof mounted exhaust fans on the factory fabricated and insulated roof curbs. Flash and counterflash to prevent leakage.

B. Mount fan base on neoprene strips on curb tops.

C. Secure fan base to curb with non-ferrous fasteners.

D. Field install motor and other accessories not factory installed.

E. Verify operation of backdraft and motorized dampers.

F. Adjust fan drives or replace sheaves as directed by the Test and Balance Firm to obtain scheduled capacities to and as required to meet field conditions.

3.4 CLEAN-UP

A. Clean all fans and components after installation is complete.

B. Vacuum clean all debris from inside scrolls, on fan wheels and at drives.

END OF SECTION

SECTION 23 81 33

SEMI-CUSTOMIZED ROOFTOP AIR CONDITIONING UNITS (GAS - ELECTRIC)

(3 TONS AND LARGER)

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with General Requirements in Division 1 - General Requirements, and all referenced documents.

B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades as required.

1.2 SYSTEM DESCRIPTION

A. The work shall include installing new specialty semi-customized electric cooling gas heating roof mounted air conditioning units to meet scheduled capacities and to effect outside air control by modulation and space relative humidity control.

B. Contractor shall connect all ductwork, condensate drain piping, gas piping, roof curbs, temperature controls, power supply, disconnects, factory furnished field installed accessories, appurtenances, insulation, supports, flashing, etc. to make a complete and operational system.

1.3 QUALITY ASSURANCE

A. All equipment and materials shall be new and of the best quality complying with all standards specified herein.

B. All equipment and materials shall be installed in a workmanlike manner by trained and experienced mechanics as recommended by the equipment manufacturer and as detailed on the Drawings.

C. Units shall be rated in accordance with ARI Standards 210/240 or 360 and 270, as applicable, and be capable of starting and running at ambient outdoor temperatures as high as 115 Deg.F. while operating to meet the maximum load requirement.

D. Units shall be designed to conform to ASHRAE Standard 15, latest revision.

E. Units shall be U.L. Tested and Certified in accordance with ANSI Z21.47 Standards as a total package for safety requirements.

F. Insulation and adhesive shall meet NFPA 90A and B requirements for flame spread and smoke generation.

G. Each unit shall be American Gas Association (AGA) Certified.

H. Unit casings shall be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500 hour salt spray test.

I. Each individual unit shall be subjected to a completely automatic factory run test on the assembly line. Each unit shall pass this run test, repair as necessary, prior to being allowed to be shipped to the project site.

J. Unit manufacturer shall establish an inventory parts program with the District to ensure the timely availability of the most common parts requiring repair or replacement. Inventory list shall be determined by mutual agreement with the Owner.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and installation instructions and method for the configuration of equipment proposed, including wiring diagrams, piping connections, ductwork connections, capacities at scheduled conditions, fan capacity curves, accessories furnished, and other descriptive literature necessary to fully evaluate the Submittals for full compliance with these specifications.

B. Shop Drawings: Submit in accordance with Sections 01 33 00 and 23 05 00.

1.5 PRODUCT HANDLING

A. Deliver all equipment to the site where it shall be covered and protected. Material not properly protected and stored and which is damaged or defaced during construction shall be replaced at no cost to the Owner.

B. Storage and protection of materials shall be in accordance with Section 23 05 00.

1.6 INSTALLATION, OPERATION, AND MAINTENANCE BROCHURES

A. Furnish all installation manuals required by a trained and experienced mechanical technician for proper installation of equipment. Manuals shall be provided with equipment and be attached thereto, or contained therein.

B. Furnish three (3) complete bound Operating and Maintenance Brochures with spare parts lists, which shall be submitted at "Substantial Completion" with Close-Out documents.

C. At project close-out, furnish an extended four (4) year compressor and fourteen (14) year heat exchanger warranty certificates to begin at the end of the first year warranty. The first year Warranty begins at Substantial Completion. Indicate specific model and serial numbers for all items of equipment furnished to be warranted. Extended warranties cover parts only.

PART 2 - PRODUCTS

2.1 PACKAGED ROOFTOP A/C UNITS

A. Packaged Rooftop Units shall be factory assembled, tested, piped, internally wired and shipped in one piece complete with an operating charge of refrigerant and oil. Units shall be direct expansion cooling, natural gas heating, with downflow discharge mounted on a full perimeter roof curb. Packages shall be complete with all operating and safety controls. All units shall be factory test run in the cooling and heating modes with the following items being monitored for each individual unit:

1. Amperage for each electrical component.
2. Refrigerant suction and discharge pressures with corresponding ambient temperatures and relative humidity.
3. Gas flow rate to burners.
4. Verify operation of all safeties by simulating condenser fan and evaporator blower failures.
5. Provide all test information along with a wiring diagram and a maintenance and operation manual inside each unit.

B. Cooling capacities shall be rated in accordance with A.R.I. standards. Capacities scheduled are gross capacities. Net capacities include deductions of fan motor heat. Submittals must show both gross and net capacities.

C. Unit casings shall be constructed of phosphatized G90 galvanized steel with factory baked acrylic-epoxy paint or bonderized and coated baked enamel finish in beige color on all exposed surfaces. All assembly screws shall be zinc-chromate coated. Unit shall be equipped with factory installed lifting or rigging lugs. Other features shall include:

1. Access to compressors, controls, filters, fan motor and other items needing periodic checking or maintenance shall be through:

   a. Hinged access panels on units from 3 to 12 tons in size.
   b. Double wall hinged access panels on sizes over 12 tons in size.

2. Blowers shall be made accessible by:

   a. Removable panels on units 3 to 6 tons in size.
   b. Double wall hinged access panels on units over 6 tons in size.
   c. Air side service access doors shall be fully gasketed with rain break overhangs, and these doors shall have a metal liner to protect insulation. All interior surfaces in contact with the air stream shall have one inch (1") mat-faced fiberglass insulation. All access doors shall be able to be opened without the use of tools. The unit casing shall be assembled in such a manner to be waterproof and provide for natural drainage. The unit base shall be watertight and constructed with 14 gauge load bearing members. Cabinet insulation shall meet ASHRAE Standard 62P and shall generally have 1.5 pound density with foil face coating used where exposed to the airstream in the heating section. The unit shall have a factory provided entry way within the cabinet for all wiring to enter from below within the confines of the full perimeter roof curb.

D. All units shall be provided with direct drive fully hermetic, or semi-hermetic, single or two-stage, or digital compressors. Compressors shall be factory rubber-shock mounted for optimum vibration isolation. Provide an oil level sight glass, oil charging valve, and two points of lubrication on semi-hermetic compressors. Provide refrigerant strainers, filter drier, and service gauge connections on the suction, discharge, and liquid lines for all compressors. High strength non-flexing ring type suction and discharge valves shall be provided. Compressor motors shall be suction gas cooled, be provided with a crankcase heater and have a voltage utilization range of plus or minus 10% of name-plate. Two winding thermostats shall be imbedded between the motor windings for semi-hermetic compressors. Scroll compressors shall have only one internal thermal protection device per winding. Any thermal overload in any single winding will be detected and alarm internal to the unit controls. Standard safety controls shall include high and low pressure cutouts, oil pressure cutouts (semi- hermetic compressors only), loss of charge protection, compressor reverse rotation protection (scroll compressors only), freeze protection, line break thermal and current overload protection, and reset relays. System shall have liquid line driers and shall be fully charged with R-410a. All Trane and Carrier units shall have specific factory installed humidity control features similar to that of the Carrier “Humidimizer” with hot gas reheat coils to achieve neutral supply air temperatures in the dehumidification mode of operation. All units larger than 7 tons shall have a minimum of 2 compressors without exception. Multiple compressor units shall be furnished with independently mounted circuits. Compressors shall be capable of operation down to 25 Deg.F. ambient outdoor temperatures. Digital scroll compressors for first stage compressor on all Aaon type units shall be provided with ECM indoor fan motors for humidity control.

E. Evaporator coils shall be constructed of seamless copper tubing mechanically bonded to heavy duty aluminum fins.

1. All cooling coils shall have galvanized steel end casings and equalizing type vertical tube distribution with a top suction connection.

2. Cooling coils shall generally have a minimum of 4 rows. Fins shall not exceed 15 fins per inch.
3. Coils shall be equipped with a thermostatically controlled expansion valve. Multi- compressor units shall be circuited with one circuit and one expansion valve per compressor.
4. Multiple circuits shall be intertwined in the evaporator coil. Single evaporator coils may be either the full face active design or be the face split design.
5. Each unit shall be equipped with a 5 minute anti-short cycle delay timer, or equivalent control strategy used for compressor protection, for each compressor.
6. Coils shall be factory pressure and leak tested at 300 PSIG.

F. Provide sloped condensate drain pans. Pans shall be sloped in two directions for positive drainage to meet ASHRAE Standard 62. Pans shall be fabricated with Type 304 stainless steel, be minimum 18 gauge in thickness and shall have all welded joints. Alternately, condensate pans can be made of a heavy duty plenum rated plastic material.

G. Condensing coils shall be fabricated of seamless copper tubing with configured aluminum fins mechanically bonded to tubing. Condenser coil shall be designed for a minimum of 10 degrees F. sub-cooling. Coils shall be factory tested to 450 PSIG air pressure and then vacuum dehydrated. Provide condenser fin hail and vandal guards. Guards shall be made of hot dip galvanized steel; or UV inhibited, PVC coated steel; or factory enamel or epoxy painted steel; or other approved corrosion resistant material. Flat expanded metal, field made devices, and screen or fencing materials are not acceptable.

H. Outdoor condenser fans shall be vertical discharge, direct drive type, propeller fans. Fans shall have aluminum or steel blades and zinc plated steel hubs which shall be statically and dynamically balanced. Motors shall have permanently lubricated ball bearings, built in current and automatic reset thermal overload protection and weather-tight slingers over bearings. Provide a corrosion resistant metal, or PVC coated steel, fan guard.

I. All supply air fans shall be either direct drive, double inlet, forward curve fans with multi-speed (5 speed or ECM; 5 tons in capacity or less only) or belt drive, double inlet, forward curve fans with adjustable sheaves. Fan motors 1 HP and larger shall be the premium efficiency type that are furnished as a standard option by the unit manufacturer. Refer to Specification Section 23 05 13 for general requirements on these motors. Where non-standard motor frames, under 5 HP in size, are the standard motor offered by the unit manufacturer and where these motors are exempt from meeting the EPACT requirements, these motors are not required to be the premium efficiency type. Motors shall have permanent lubricated bearings. Fans shall be statically and dynamically balanced. Fan bearings shall be self-aligning, grease lubricated, ball or roller bearings, of the pillow block type with 200,000 hour bearing design, easily accessed for servicing. Fan wheels shall be constructed of aluminum or steel and be coated with a corrosion resistant finish. Provide optional/alternate motor and drive assembly to produce the design CFM and external static pressure scheduled where required based on scheduled requirements.

J. Outside air shall be controlled by an optimized dry-bulb type economizer with multi-stage integrated economizer and compressor operation for optimum benefit:

1. The economizer shall consist of motor operated fully modulating type outdoor and return air dampers, both sequenced and fully adjustable, constructed from low leakage dampers that utilize metal blades with rubber edge seals and aluminum or stainless steel end seals. Damper blades shall be gear driven and be designed to have no more than 25 CFM of leakage per square foot of damper area when subjected to 2" W.G. air pressure differential across the damper, or less than 2% at a total static pressure of 0.5 Inches W.G., with a negative return air static pressure of 0.05 Inches W.G.
2. Damper motors shall be the spring return type to insure the tight closing of the outdoor air damper during periods of unit shut down or power failure. The outside air damper and actuator shall be capable of opening to a pre-set minimum when the unit is operated in the normal occupied mode. Provide a field adjustable end switch, or equivalent control feature such as a potentiometer or SCR, to allow minimum outside air adjustment to that as scheduled.

3. A pressure relief damper sized for 100% relief air shall be provided as part of the economizer.
4. The economizer shall be completely factory installed, wired and run tested.
5. For units 10 tons in capacity and larger furnish a powered exhaust relief as a part of the economizer package.
6. Damper actuators shall be compatible with standard 0-10 Vdc Energy Management System output signal to allow modulating control of the minimum outside air flow rate for return air carbon dioxide level control, whether utilized or not. Actuators shall be a “Belimo MFT” type actuator.
7. Provide weather protected hoods over each outside air intake and relief air outlet. Provide protection from birds on all hoods, using galvanized steel bird screen (1/ 2" x 1/2" wire mesh) or other approved method.

K. Heating Section:

1. Induced draft power combustion type with energy saving electronic direct spark ignition system and induced draft direct drive centrifugal blower with an electric differential pressure switch to lock out the gas valve until the combustion chamber is purged and combustion air flow is established. Induced draft combustion motor shall have permanently sealed bearings and inherent automatic-reset thermal overload protection.
2. Heat exchanger shall be of the tubular section type constructed of a heavy gauge Type 409 (Trane and Carrier) or Type 304 (Aaon) stainless steel for enhanced corrosion resistance.
3. Burners shall be of the in-shot type designed to use natural gas and be equipped with a gas valve and combustion blower. Two to four stage type gas furnaces shall have redundant dual gas valves. Heating control shall be initiated by a 0-10 Vdc signal from a DDC Control System or other signal compatible with the Energy Management System provided and the control sequences specified elsewhere herein.
4. All gas piping shall enter the unit cabinet at a single location.
5. Provide flue up discharge deflector where an option exists with the manufacturer.
6. Unit tubular stainless steel gas heat exchangers shall carry a 15-year non pro-rated warranty starting at "Substantial Completion".
7. Furnace section shall have foil faced insulation on the air side of the casing.
8. Heating section controls shall also consist of a redundant main gas valve, associated time delay relays, limit switches, centrifugal switch, high temperature limit switch, flame rollout switch and flame proving controls.

L. Furnish two inch (2") filter racks with two inch (2") thick pleated media filters shipped with the unit, 30% efficient, equal to Camm-Farr 30/30 filters, ship with MERV 8 filters. Both return and outside air shall be filtered by the same filter bank. Filters shall be provided in a large enough quantity to limit the actual face velocity to no more than 375 feet per minute. Filters shall be one standard commercially available size. Filters shall be accessible without the use of tools. All replacement filters shall be as specified in Specification Section 23 30 00. All filter racks shall be provided with accordion type spacers and gaskets to minimize the potential for any bypass air around the filter rack.

M. Roof curbs shall be minimum 18" in height (except where noted on drawings to be taller) and be constructed of minimum 18 gauge G-90 galvanized steel. Curbs shall be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curbs shall provide for the full support for both the supply and return air ducts. Provide manufacturers standard knock down style curbs with hinged corners. Provide for a separate thru utility vertical entry point within the footprint of the inside of the curb; no penetrations allowed in the side (vertical portions) of curbs. Curbs shall be fully perimeter insulated with minimum one inch (1") thick neoprene coated rigid fiberglass insulation, minimum 1.5 pcf density, either factory or field insulated. Provide a 2" x 4" treated wood nailer strip around the full perimeter of the curb. All curbs shall be built to meet the National Roofing Contractor Association (NRCA) requirements. Provide curbs that are pitched to match the roof slope, from 1/4" to 12" pitch, so that the rooftop unit sits level above the roof.

N. Units shall have a factory installed and wired non-fused disconnect. Additionally, provide a non-powered weatherproof 10 amp capacity, 115 volt, GFCI, duplex service receptacle inside the control compartment, or on the exterior of the cabinet, for each unit where shown on the Drawings. Receptacle power supply shall be from separate 115 volt circuit.

O. All roof top A/C Units shall have minimum ARI, EER or SEER and furnace AFUE efficiencies as scheduled, each of which shall meet or exceed that required by the 2015 International Energy Conservation Code. All rooftop air conditioning units five (5) tons and less in capacity shall be a minimum 17 SEER efficiency.

P. Factory mount and wire terminal equipment controllers furnished by the unit manufacturer (Trane and Carrier) or under Specification Section 23 09 00 (Aaon). Operating controls shall include the following:

1. Each unit shall have a minimum of two (2) stages of heating and cooling on all units over 7 tons.
2. Provide a Conventional Thermostat Interface (CTI) with wiring terminals provided by the unit manufacturer to allow for the interface and control of the number of stages of heating and cooling and the supply fan.
3. Integrated controls shall be furnished by the equipment manufacturer on the unit at the factory under this Section of the Specifications. Controls shall be suitable for field wiring of other temperature control related sensors and accessories furnished under Specification Section 23 09 00. Fully coordinate all control items between both of these Sections of Specifications.
4. Each cooling system shall also incorporate a dehumidification and refrigerant cycle reheat or digital compressor capability to control space relative humidity to no higher than 60% R.H., adjustable. Sensible cooling shall take priority over the dehumidification mode, and this shall be determined internal to the unit, via, an external 0-10 VDC control signal which shall equate to the space relative humidity level. At the option of the Energy Management System supplier, this can be emulated through the local unit controller. Fully coordinate the method used with all trades involved.
5. The integrated gas controller (IGC) diagnostics board shall include gas heat operation fault notification using a LED (light-emitting diode). Each unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch, or three continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED. The IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch. LED display shall be visible without removal of control box access panel.

Q. All refrigeration systems shall use an EPA approved refrigerant that will be readily available in the commercial market for the next 10 years under current legislation and protocols. R-410a is the preferred refrigerant to be used. All units furnished on a project shall all utilize the same refrigerant.

R. Unit electrical connections shall consist of suitable openings in the cabinet for routing of all utility connections within the roof curb to include through-the-bottom power supply connection. The base unit shall contain a low voltage terminal strip in the control compartment to allow for terminal-to-terminal connection of room thermostat (temperature sensor) and field installed accessories. Electrical controls shall be complete with self-contained low voltage control circuit protected by an automatic reset device. Al l unit power wiring shall enter the cabinet at a single factory pre-drilled location designed for single point electrical service. Unit voltages shall be as scheduled on the Drawings.

S. Provide the following additional spare parts for entire order:

1. One additional unit mounted disconnect for 5 ton unit size.
2. One additional 5 ton compressor.

T. Units shall be as manufactured by:

1. Aaon with digital scroll compressors.

2. Trane, with humidity control, minimum 17 SEER units for 3-5 ton.
3. Carrier, with Humidimizer Style Units, minimum 17 SEER units for 3-5 ton.

2.2 TEMPERATURE CONTROL

A. Under Specification Section 23 09 00, Controls and Instrumentation, space temperature, and relative humidity, as applicable, shall be provided for field installation along with factory mounted and wired terminal unit controllers to control units. Only designated units will have carbon dioxide sensor control.

B. Each rooftop A/C unit shall have wiring terminals, low voltage terminal strip, to receive signals from the Terminal Unit controller to receive CTI, PWM, 4-20 ma, or 0-10 volt D.C. signals, as applicable, signals to stage on and off heat, energize compressor(s), energize a hot gas reheat sequence, as applicable, control the economizer cycle, and modulation of the outside and return air damper. Provide contacts to energize and de-energize the unit.

PART 3 - EXECUTION

3.1 DELIVERY AND PROTECTION

A. Deliver all equipment to each site. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt.

B. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost.

C. During construction, take all steps necessary to protect equipment from damage or vandalism. All damage or vandalism shall be repaired at no cost to the Owner.

3.2 ROOFTOP A/C UNITS

A. Install manufactured roof curbs on the roof square and level to receive the units. Provide and install additional steel framing as required to provide safe, noiseless, operating systems. Locate units with condensate drain pans sloped for positive pan drainage.

B. Coordinate the electrical services and control wiring with the Electrical Systems Installer. Coordinate the condensate drainage and gas supply piping systems with the Plumbing Systems Installer. The manufacturer of each item of equipment shall provide complete wiring diagrams to the Electrical Systems Installer and shall provide drawings indicating all required external wiring, piping and arrangement of all field connections.

C. Coordinate the exact unit locations with the structural systems and the ceiling systems below as actually installed. Shim roof curbs, or adjust as applicable, to make entire top of each curb level.

D. Make all sheet metal supply and return duct connections with flexible duct connections below the roof.

E. Install sound and vibration isolation devices as detailed on the Drawings. Install continuous 2" wide by 3/8" thick neoprene isolation strip along the full perimeter of the roof curb for a complete air seal.

F. Provide for one (1) additional set of fan sheaves for each belt drive unit, as required by the Testing and Balancing Firm, to obtain design air flows. For bidding purposes provide one (1) set of sheaves and belts where required, as follows:

# of Units	Minimum # Sets of Belts & Sheaves
1 - 5	3
6 - 10	5
11 - 15	7
16 - 20	9
21 - 30	14
31 or more	33%

G. Gas furnaces shall be jumpered to operate at full fire, with the supply fan operating, for a minimum of thirty (30), but not more than sixty (60), minutes to burn off dust, lint, and factory produced oil films. Remove jumper after this process is completed. Perform this work in such a fashion as not to void equipment warranties. Documented factory run tests conducted for 30 minutes will be considered, but must be approved by the Engineer.

H. At start-up, have all units served by a gas pressure regulator, external to the units, operated at full fire, and adjust gas supply pressure to these units to be between 7-10 inches W.G. Document in writing actual pressure measured going into unit, as well as manifold pressure. Include this information in Start-up Report to be submitted with Close-Out Documents.

I. Verify all items internal to unit controlled by the terminal equipment controller functions when commanded to operate. Verify that all dampers fully modulate and that they close fully when commanded to be in that position.

J. Do not operate units without specified air filters being installed. Failure to do so will result in the Contractor cleaning coils at no cost to the Owner.

K. Tighten and align fan belts and lubricate all bearings. Verify proper rotation of moving parts.

L. Install all field installed accessories.

M. Make all power and control wiring connections.

N. Verify correct operation of equipment, accessories, and control devices.

3.3 CLEANUP

A. Clean evaporator and condenser coils, condensate pans and condensate drain piping after installation of rooftop A/C units is complete.

B. Clean all debris from inside rooftop A/C unit casings

C. Replace air filters with new type and when indicated as indicated in Specification Section 23 30 00.

3.4 OPERATING PROCEDURES AND REQUIREMENTS

A. Operating and service instructions in illustrated and bound form shall be furnished by the manufacturer, three (3) copies, at "Substantial Completion".

B. At startup, the equipment manufacturer shall furnish skilled personnel, separate from the installing contractor’s work force, to supervise, check out performance, make any required adjustments, place all units in service, and instruct the Owner's personnel for a full period of two (2) hours for each 15 units provided. Fill out a manufacturer’s start-up report, to be typewritten, for each new unit installed which shall reflect the operating conditions of the electrical power supply, refrigeration system and gas furnace.

3.5 WARRANTY

A. Transfer Full Parts and Labor Warranty to Owner for a full one (1) year period beginning at "Substantial Completion".

B. Transfer any and all other warranties as applicable over to the Owner at "Substantial Completion", including extended 4-year compressor warranties, as applicable, on refrigeration equipment and extended 14-year warranties on stainless steel heat exchangers, as applicable.

END OF SECTION

SECTION 26 00 00

ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Division and all Electrical sections contained hereinafter are subject to the Contract Documents of Division 1 whether attached or not, the various Divisions of the General Construction specifications and Division 23 of the Construction specifications and respective plans.

B. All drawings, material in other Divisions of these specifications, addenda, and other pertinent documents are considered to be a part of the technical requirements of this Division of the specifications insofar as they are applicable.

C. The material contained in this section shall be applicable to other sections of the specifications under this Division.

1.2 DEFINITIONS

A. The following definitions shall apply to all sections of this Division:

1. "Owner" shall mean the Owner or his designated representative.

1.3 SCOPE OF WORK

A. This Division and all electrical sections of the specifications include all labor and material to complete all electrical systems as specified or shown on the Drawings.

B. All work shown and specified shall be completely installed and connected in a workmanlike manner by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner.

C. Provide all services and perform all operations required in connection with or properly incidental to the construction of complete and fully operating systems with all accessories as herein specified or shown on the Drawings.

1.4 GENERAL

A. The accompanying plans show diagrammatically the location of the various light fixtures, devices, conduits and equipment items, and methods of connecting and controlling them. It is not intended to show every connection in detail or all fittings required for a complete system. The Contractor shall carefully lay out his work at the site to conform to the conditions, to avoid obstructions and provide proper routing of raceways. Exact locations of light fixtures, devices, equipment, and connections thereto shall be determined by reference to the accompanying Plans, etc., by field measurement at the project, and in cooperation with other Contractors and Sub-Contractors, and in all cases shall be subject to the approval of the Owner. Minor relocations necessitated by the conditions at the site or directed by the Owner shall be made without any additional cost to the Owner.

B. These specifications and the accompanying drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. The Contractor shall be responsible for the proper fittings of his material and apparatus into the building and shall prepare installation drawings for all critical areas illustrating the installation of his work as related to the work of all other trades. Interferences with

other trades or with the building structures shall be corrected by the Contractor before the work proceeds. Should any changes become necessary due to failure to comply with these stipulations, the Contractor shall make such necessary changes at his own expense.

C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

D. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide those details or special construction as well as to provide material and equipment usually furnished with such systems or required to complete the installation.

E. The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability and that he will install his work in a satisfactory manner which is up to the best standards of the trade, complete and in good working order. If any of the requirements of the Drawings and Specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, he shall report such occurrences to the Owner promptly after discovery of the discrepancy.

F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.5 INSPECTION OF THE SITE

A. The Contractor shall visit the site, verifying all existing items indicated on the Drawings or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil, conditions, and local requirements. The submission of bids shall be deemed evidence of such visit.

B. All proposals shall take these existing conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.

C. All site visits shall be coordinated and scheduled with the Owner.

1.6 CODE REQUIREMENTS

A. All work shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Architect, and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies, and all authorities having jurisdiction over the work, or services thereto. In all cases where alterations to, or deviations from, the drawings and specifications are required by the authority having jurisdiction, report the same in writing to the Architect and secure his approval before proceeding. Upon completion of the work, furnish a statement from the inspecting authority stating that the installation has been accepted and approved. Provide complete utility service connections as directed, and submit, as required, all necessary drawings; secure all permits and inspections necessary in connection with the work, and pay all legal fees on account thereof. In the absence of other applicable local codes acceptable to the Architect, the National Electrical Code shall apply to this work.

1.7 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all locations of equipment, panels, and all deviations and/or changes in the work shall be recorded. All underground and overhead utilities provided under, or affected by, work of this Division shall be accurately located by dimensions. These "Record" drawings shall be delivered to the Architect in good condition upon the completion and acceptance of the work and before final payment is made.

1. Refer to Division 1 requirements.

1.8 RECORDS AND INSTRUCTIONS FOR OWNER

A. The Contractor shall accumulate, during the project's progress, the following sets, prepared in neat brochures or packet folders and turned over to the Architect for checking and subsequent delivery to the Owner:

1. All warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
2. Approved equipment brochures, wiring diagrams and control diagrams.
3. Copies of reviewed Shop Drawings.
4. Operating instructions for all systems. Operating instructions shall include recommended maintenance procedures.
5. Any and all other data and drawings required during construction.
6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.

B. All of the above data shall be submitted to the Architect for review at such time as the Contractor makes application for final payment, but in no case less than two weeks before final observation.

C. The Contractor shall also give not less than two (2) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. The written operating instructions referred to in above paragraphs shall be used as a basis for this on-the-job instruction.

1. Refer to Division 1 requirements.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. The Contractor shall submit, to the Architect, shop drawings and catalog data on all equipment and materials designated on the Drawings and specified herein.

B. The submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgement of compliance does not relieve the Contractor from responsibility for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all the dimensions for proper fit of all parts of the work and performance of all equipment supplies to meet specification requirements are and remain specific responsibilities of the Contractor.

C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary, and should there be any charges in connection with this, they shall be borne by the Contractor.

D. The Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheet therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered.

E. Shop Drawings submitted without indicating markings or Contractor's stamp shall not be reviewed and will be returned to the Contractor for correction of such discrepancies.

F. The Shop Drawings are not intended to cover detailed quantitative lists of electrical specialties, and similar items, as the plans and specifications illustrate and describe those items, and it is the Contractor's responsibility to procure the proper sizes and quantities required to comply with the established requirements.

G. Any Shop Drawings prepared to illustrate how equipment can be fitted into available spaces will be examined under the assumption that the Contractor has verified all the conditions, and obtained any approval thereon shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Drawings.

H. Various material submissions of such as raceways, switches, panelboards, and related items shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets.

I. Each Contractor shall process his submitted data to insure that it conforms to the requirements of the plans and specifications and that there are no omissions, errors or duplications.

J. Shop Drawings shall be accompanied by certification from this Contractor that Shop Drawings have been checked by him for compliance with Contract Drawings.

K. Samples of various products or mock-ups of particular details or systems may be required by various sections of this Specification.

L. Refer to Division 1 requirements.

1.10 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Division 1.

1.11 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

A. All equipment furnished under other Divisions of the specification requiring service connections shall be connected by this Contractor. Materials and labor required for the connection of this equipment shall be furnished under Division 26. The respective supplier shall furnish proper roughing-in diagrams for the installation of these items. All items shall be roughed-in and connected in strict accordance therewith. All equipment requiring connection may not be specified herein, but may be included in other Division documents. This Contractor shall ascertain for himself all equipment so specified is included as part of his work.

B. Refer to Section 26 05 23.

1.12 DRAWINGS

A. The drawings show diagrammatically the locations of the various conduits, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building and in cooperation with other trades and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.

B. Should any changes be deemed necessary in items shown on the contract drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention before bids are submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate his particular apparatus.

D. Lay out all work maintaining all lines, grades, and dimensions according to these drawings with due consideration for other trades and verify all dimensions at the site prior to any fabrication or installation; should any conflict develop or installation be impractical, the Architect shall be notified before any installation or fabrication and the existing conditions shall be investigated and proper changes effected without any additional cost.

E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.13 COOPERATION

A. All work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.

B. Maintaining contact and being familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed shall be the responsibility of this trade as will the installation of the required systems in their several stages, at the proper time to expedite this contract and avoid unnecessary delays in the progress of other contracts.

C. Should any question arise between trades as to the placing of lines, ducts, conduits, or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Architect for instructions.

1.14 MATERIALS AND EQUIPMENT

A. All materials purchased for this Project shall be new.

B. Where specified product is not manufactured, manufacturer's current product meeting specification shall be substituted, subject to written approval of Engineer.

C. Space allocations in electrical spaces are based on equipment scheduled in each case. Should the Contractor offer equipment of another make, he shall verify that such equipment will fit in the spaces allowed.

D. Manufacturers' names are listed herein to establish a standard. The products of other manufacturers will be acceptable; if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.

E. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior as the Architect or his Engineer is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturers' engineering data, specification sheet, and a sample, if practical or if requested. In no event shall a proposal for substitution be cause for delay of work.

F. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall

replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

1.15 STORAGE AND PROTECTION OF MATERIALS

A. The Contractor shall provide his own storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, or as directed by the Owner's representative. In no case shall storage interfere with traffic conditions in any public or project thoroughfare.

B. All work and material shall be protected at all times. This Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all electrical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

1.16 FOUNDATIONS

A. Provide bases and foundations for all equipment specified or shown, unless specifically noted to the contrary. Foundations are generally to be built in compliance with the equipment manufacturer's shop drawings which have been approved by the Architect, or as directed by the Architect. Vibration or noise created in any part of the building by the operation of any equipment furnished or installed under this portion of the work will be objectionable. Take all precautions against same by isolating the various items of equipment from the building's structure, and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed; install all foundations, supports, etc., for raceway system and equipment with this end in view.

1.17 EXCAVATION AND BACKFILLING

A. The Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the conduit and refilled to grade as specified. After the conduit has been installed and approved, the trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by the Architect shall be a part of this contract.

1.18 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in execution of the work. The various Contractors shall perform their work at such times as directed so as to insure meeting scheduled completion dates, and to avoid delaying any other Contractor. The Architect will set up completion dates, schedule the times of work in the various areas involved, etc. This Contractor shall cooperate in establishing these times and locations and shall process his work so as to insure the proper execution of it.

1.19 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Contractor shall provide qualified personnel, as requested by the Owner and Architect, to assist in all on-site testing and commissioning of all equipment.

1.20 CLEANING UP

A. The Contractor shall be responsible for cleaning up his work as specified in the General Requirements of these Specifications.

1.21 FINAL OBSERVATION

A. Schedule: Upon completion of the Contract, there shall be a final observation of the completed installation. Prior to this observation, all work under this Division shall have been completed, tested, and balanced and adjusted in final operating condition and the test report shall have been submitted to and approved by the Owner.

B. Qualified personnel representing the Contractor must be present during final observation to demonstrate the systems and prove the performance of the equipment.

1.22 CERTIFICATIONS

A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.

B. Furnish, at the completion of the job, a final Inspection Certificate from the local inspecting authority.

1.23 GUARANTEE

A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance. The Contractor shall also guarantee that the performance of all equipment furnished and/or installed under this Division of the specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Engineer may direct to demonstrate that the equipment installed meets the specifications. If there is indication that the equipment does not meet the specifications, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to provide recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

B. Refer to Division 1 requirements.

PART 2 - PRODUCTS

NOT USED

PART 3 - INSTALLATION

3.1 DEVICE MOUNTING REQUIREMENTS

A. Mounting heights listed in Drawings shall be defined as measured from the centerline of the device or outlet box to finished floor elevation. Unless specifically noted otherwise on the Drawings. Device heights shall be in accordance with the Texas Accessibility Standards or the Americans with Disabilities Act.

B. Where devices are grouped together, they shall be mounted at the same height.

C. Coordinate all mounting dimensions with Owner's requirements and coordinate with architectural elevations and details.

3.2 HOUSEKEEPING PADS

A. Provide 4 inch thick concrete housekeeping pad with 6 x 6 wire mesh and same cure strength as adjacent floor for all floor-mounted electrical equipment unless otherwise indicated on the Drawings. Provide dowel connections to floor if pad is not part of continuous floor pour.

1. Provide inserts for anchor bolts as required for each floor-mounted piece of electrical equipment.
2. Provide 3/4 inch chamfered edge at all exposed edges.

B. Minimum pad dimensions shall be 6 inches greater than dimensions, including all protrusions, of equipment to be installed.

1. Free-standing equipment: Center equipment on housekeeping pad.
2. Equipment anchored to wall: Center equipment side-to-side on housekeeping pad and reduce pad front-to-back dimension by 3 inches.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide systems of wires and cables for electric power, signaling and control.

B. Related work specified in other sections

1. 26 00 00 - Electrical
2. 26 05 20 - Cable Connections
3. 26 05 23 - Control Voltage Electrical Power Cables
4. 26 05 32 - Raceways
5. 26 05 33 - Raceway and Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. ICEA 5-61-402 Thermoplastic Insulated Wire and Cable

B. ICEA 5-66-524 Cross Linked Thermosetting Polyethylene Insulated Wires and Cables

C. ICEA 5-68-516 Ethylene Propylene Rubber Insulated Wire and Cable

D. ICEA 5-19-81 Rubber Insulated Wire and Cable

E. ANSI 1581 Standard of Electrical Wires, Cables, and Flexible Cords.

F. UL 83 Thermoplastic Insulated Wires and Cables

G. UL 1569 Metal Clad Cables

H. ASTM B3 Standard Specification for Soft or annealed Copper Wire

I. ASTM B8 Standard Specification for Concentric Lay Standard Copper Conductors

1.5 SUBMITTALS

A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer's product literature completely describing conductors and cable assembles and evidence of U.L. Listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver conductors and cable assemblies to the project in the manufacturer's standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.

B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.

C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

A. The material shall be the product of a manufacturer with a minimum of ten years experience in the manufacture of similar material.

B. Acceptable Manufacturers:

1. AFC Cable Systems.
2. Cerro Wire, Inc.
3. General Cable
4. Southwire Company
5. Okonite Company

1.8 WARRANTY

A. The material shall be warranted to be free from defect and in proper working order for one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Copper Conductors

1. Conductors shall be copper unless specifically noted otherwise on the Drawings.
2. Copper conductors shall be soft drawn annealed copper, minimum conductivity 98% of pure copper per ASTM ASTM-B3.
3. Sizes No. 10 AWG and smaller shall be solid conductor, single strand.
4. Sizes No. 8 AWG and larger shall be concentric lay Class B stranding.
5. Shall conform to the Conductor Properties proscribed in the NEC.

B. Insulation

1. Type THWN: 600 volt moisture and heat resistant thermoplastic rated 75 Deg.C. in wet or dry.
2. Type THWN-2: 600 volt moisture and heat resistant thermoplastic rated 90 Deg.C. in wet or dry locations.
3. Type XHHW: 600 volt moisture resistant cross linked polyethylene rated 75 Deg.C. in wet or dry locations.
4. Type XHHW-2: 600 volt moisture resistant cross linked polyethylene rated 90 Deg.C. in wet or dry locations.

C. Cable Assemblies:

1. Type UF: 600 volt moisture and heat resistant, rated 75 Deg.C. for wet, dry or underground direct burial installations.
2. Type MC Branch Circuit Cable: 600 volt, Type THHN/THWN conductors size 12 AWG through 10 AWG, including a green insulated grounding conductor, with steel interlocked armor applied over the assembly.

PART 3 - EXECUTION

3.1 USES PERMITTED

A. Unless specifically noted on the drawings, permitted by the NEC and local codes and ordinances, wiring shall be Types THWN-2 or XHHW-2 installed in metal raceways as specified in 26 05 32, Raceways.

B. For final connections from junction boxes mounted on the building structure to recessed lighting fixtures. Type MC cable assemblies shall be permitted, with the cable assembly length not to exceed six feet and with supports as required by the NEC. Fixture-to-fixture chain wiring is not permitted.

3.2 COLOR CODING

A. Where available, insulation shall be color coded by factory pigmentation for each phase and each voltage system employed on the project.

B. 120/208 volt systems:

1. Phase A - Black
2. Phase B - Red
3. Phase C - Blue
4. Neutral - White
5. Ground - Green

C. 277/480 volt systems:

1. Phase A - Brown
2. Phase B - Orange
3. Phase C - Yellow
4. Neutral - Gray
5. Ground - Green

D. Switch legs, travelers and special systems shall be continuous color scheme throughout the project as selected by the Contractor.

E. Where factory pigmentation is not available, code conductors with 1-1/2" colored tape band at each terminal and at each pull or junction box.

3.3 GROUNDING CONDUCTORS

A. All branch circuits and feeders shall include an insulated equipment grounding conductor. Raceway systems shall not be used as the sole equipment grounding path without specific approval.

3.4 MULTIWIRE BRANCH CIRCUITS

A. Multiwire branch circuits shall not be permitted unless required by the device served, such as for connection to modular furniture systems or track lighting systems.

B. Where multiwire branch circuits are required, branch circuit breakers shall be two or three pole with common trip and one handle.

3.5 MINIMUM SIZE

A. Conductors shall be of the minimum size shown on the drawings, lighting and power branch circuit wiring shall be minimum No.12 AWG.

B. Feeder circuit wiring shall be sized to limit the effect of voltage drop, based on the actual installed conductor length to limit voltage drop to 2% of nominal system voltage.

C. Branch circuit wiring shall be size to limit the effect of voltage drop, based on the actual installed conductor length, to limit voltage drop to 3% or less of nominal system voltage.

D. Circuits shall be grouped in raceways and grouped together when passing through enclosures to have phases and neutral grouped together to minimize circuit reactance.

3.6 INSTALLATION

A. Examine the system in which the conductors are to be installed for defects in equipment and installation which may cause damage to the conductors, insulation, or jackets.

B. Pull a swab or mandrel through conduit systems immediately before pulling conductors to insure a full bore, clean raceway system.

C. Do not exceed the conductor manufacturer’s maximum pulling force or minimum bending radius.

D. Use pulling lubricant compound where necessary and recommended by the manufacturer.

E. Conductors or cables which have insulation or jackets damaged in the pulling process shall be removed and replace with new material.

3.7 FIELD QUALITY CONTROL

A. Test all wiring insulation with a megohm meter prior to energization:

1. Phase to ground
2. Phase to phase
3. Phase to neutral
4. Neutral to ground

B. Perform test in accordance with manufacturer’s recommendation and to meet manufacturer’s published minimum insulation values.

C. Correct all defects revealed by such tests including replacing material with new as required.

END OF SECTION

SECTION 26 05 20

CABLE CONNECTIONS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1- General Requirements and related documents.

B. All sections of this Specification.

1.2 DESCRIPTION

A. Work Included: Provide wire connections and devices to be readily identifiable, mechanically and electrically secure wiring system.

B. Related work specified in other sections:

1. 26 05 19 Low Voltage Electrical Power Conductors and Cables

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Samples: Provide samples upon specific request.

B. Product Data: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and electrical ratings.

1.5 DELIVERY, STORAGE AND HANDLING

A. Connections shall be made in atmospheres that are free from dirt, moisture, and elements which may be damaging.

1.6 MANUFACTURERS

A. The materials shall be the product of a manufacturer with a minimum ten years experience in the manufacture of similar materials.

B. Acceptable manufacturers are listed with the products.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Spring Connectors: Ideal "Wingnut" 3M-Scotch, Buchanan, and Thomas and Betts.

B. Terminal Connectors: O-Z/Gedney, Burndy, and Thomas and Betts.\

C. Splice Connectors: O-Z/Gedney or Burndy with insulating cover.

D. "T" and Parallel Connectors: O-Z/Gedney or Burndy with insulating cover.

E. Vinyl Plastic Tape: 3M-Scotch #33 or #88, Plymouth and Okonite.

F. Rubber Tape: Okonite, 3M-Scotch and Plymouth.

G. Colored Tape: 3M-Scotch, Plymouth.

H. Wire Ties: Thomas and Betts "Ty-Rap", Ideal and Panduit.

I. Tie Mounts, Plates, Anchors: Thomas and Betts, Ideal, and Panduit.

J. Wire Tags: Self-laminating, cloth, wrap-on type by Thomas and Betts, Ideal, and Brady.

K. Terminal Strips: Nylon; 600 volt; modular plug-on construction; tubular compression slip-in terminals properly sized; complete with mounting track, end clips, and anchors by Allen-Bradley, Square D, and Buchanan.

L. Cable and Cord Fittings: Crouse-Hinds with wire mesh grip or Appleton.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine wires to be joined, tapped, spliced, terminated, and their connecting devices for defects which may affect the mechanical and electrical integrity of the connection.

B. Do not proceed until defects are corrected.

3.2 PREPARATION

A. Remove proper amount of insulation necessary for connection, clean conductors.

3.3 INSTALLATION

A. No. 10 Wire and Smaller: Connect with spring connectors, terminate at terminal strips.

B. No. 8 Wire and Larger: Connect and terminate with above specified tape half-lapped to produce a dielectric value equal to wire insulation.

C. Train, hold, clamp, and tag wiring in cabinets, pull boxes, panels, and junction boxes with above specified devices.

D. Splices in feeders and mains may only be made where designated on the drawings and where prior approval is obtained from the Architect.

E. Install terminal strips in enclosures without means for termination of wiring.

F. Install cable and cord grips on all cables and cords, entering enclosures. Use wire mesh grips where necessary for strain relief.

3.4 FIELD QUALITY CONTROL

A. Test: Connections shall be resistance tested with megohm meter as specified for wire.

3.5 ADJUSTMENTS

A. Assure that wire connections made by others in equipment furnished by others are mechanically and electrically sound prior to energization.

END OF SECTION

SECTION 26 05 23

CONTROL - VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide power wiring, raceways, and connections for items of equipment and control systems.

B. All wiring for every system shall be installed in metal conduit. Refer to Section 26 05 32 Raceways for conduit types and materials for specific locations and applications.

C. Related work specified in other sections:

1. 23 09 00 Instrumentation and Controls for HVAC
2. 26 00 00 Electrical
3. 26 05 19 Low Voltage Electrical Power Conductors and Cables
4. 26 05 32 Raceways
5. 26 28 16 Enclosed Switches and Circuit Breakers
6. 28 31 00 Fire Alarm System

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 WARRANTY

A. The material shall be warranted to be free from defect and in proper working order for one year following the date of final acceptance.

1.5 COORDINATION

A. For equipment furnished under other Divisions, obtain equipment supply and wiring requirements from the Contractor supplying the equipment.

B. For equipment furnished under Division 23, obtain complete temperature control system drawings, and power supply and interlock wiring requirements from the Contractor furnishing the systems.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to related work specified in other sections for material requirements.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Work Included: The Electrical Contractor shall provide:

1. Branch circuit and motor feeder circuit conductors, raceway, connections, and overcurrent protection for each motor or item of equipment furnished by the Owner or other Contractors.
2. Installation of motor controllers furnished by the Owner or other Contractors, along with branch circuit and motor feeder circuit conductors, raceway, and connections in accordance with the manufacturer's approved wiring diagrams.
3. Disconnect switches and combination disconnect switches and motor controllers, where indicated on the drawings or required by codes, except as provided as an integral part of manufactured equipment.
4. Power supply conductors, raceway, connections, and overcurrent protection for input power to HVAC Temperature Controls, HVAC Automation, and HVAC Energy Management Systems in accordance with approved rough-in and connection diagrams furnished by the system suppliers.
5. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to insure that all work is contained within the General Contract. Nothing herein shall be construed to confine the General Contractor from assigning the work to any member or group of contractors deemed best suited to executing the work to effect the contract. Refer to specific bidding instructions of the General Contractor for the actual division of the work. The General Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.

B. Work Not Included: The Mechanical Contractor shall provide:

1. Motors and equipment, erected in place and ready for final connection of power supply wiring, along with manufacturer's approved wiring diagrams.
2. Motor controllers, in suitable enclosures and of the type and size in accordance with the manufacturer's recommendations and NEMA requirements, along with properly sized overload elements and approved wiring diagrams.
3. Disconnecting switches or devices which are normally provided as a part of manufactured equipment.
4. Rough-in and connection diagrams for input power supply and connections for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems.
5. Conductors, raceways, devices, and connections for low voltage control, line voltage control, and signaling systems for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems in accordance with the provisions of Division 26, and approved systems shop drawings to provide complete operating systems in accordance with the functional requirements of the specifications.
6. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to insure that all work is contained within the General Contract. Nothing herein shall be construed to confine the General Contractor from assigning the work to any member or group of contractors deemed best suited to executing the work to effect the contract. Refer the specific bidding instructions of the General Contractor for the actual division of work. The General Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.

C. Completely connect all electrical consuming items of mechanical equipment, kitchen equipment, shop equipment, etc., provided by the Owner or other trades. Outlets of various types have been indicated at equipment locations, but no indications or exact location or scope of work is indicated on the accompanying drawings.

D. Refer to details and information furnished by the Owner and various equipment suppliers for equipment wiring requirements and to the Plumbing and Heating, Ventilating and Air Conditioning Specifications for the scope of the connections to equipment provided under those sections, and determine from the various trades by actual measurements at the site, and by direction from the Owner and the Architect the exact locations of all items. Roughing-in drawings, wiring diagrams, etc., required for the proper installation of the electrical work will be furnished by applicable trades furnishing equipment. Request the drawings and information required in writing to the equipment supplier in ample time to permit preparation of the drawings and to permit proper installation of all wiring. Obtain from those furnishing equipment the size and type of service required for each motor or piece of electrical equipment and verify that the service to be installed is compatible.

3.2 INSTALLATION

A. All conduits shall terminate in conduit boxes on motors where possible. When motors are direct-connected, the conduit may continue rigid into the box, but when motors drive through belts and have sliding bases, a piece of flexible liquid tight conduit not less than 12 inches long shall be connected between the rigid conduit and the motor terminal. Where motors are not provided with conduit boxes, terminate the conduit in a condulet at the motor.

B. Where disconnecting switches are not provided integral with the control equipment for motors, provide and install a disconnect switch in the circuit to each motor where indicated and required by code. Switches shall be installed as close as possible to the motor or controls they serve and they shall be within sight of the motor or control circuit.

C. Be responsible for installing all conductors and protective devices serving equipment motors furnished by others in strict conformance with all applicable codes, regardless of any discrepancy in plans and/or mechanical equipment sizes variations, unless covered by directives issued by the Architect.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide a grounding electrode for the facility and a ground electrode conductor system to connect to the electric service main equipment.

B. Provide supplementary grounding electrodes as specified herein.

1. Provide connections from the grounding electrode system to:
2. The electric power system grounded circuit conductor (neutral).
3. The electric power system non-current carrying enclosures and equipment ground conductors (equipment ground).

C. Provide connections from the grounding electrode system to auxiliary ground conductors for data and voice communication systems (isolated ground).

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. National Electrical Code, NFPA 70.

B. EIA/TIA Standard 607

C. IEEE - Standard 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. IEEE Standard 81 - Guide for Measuring Earth Resistivity.

1.5 SUBMITTALS

A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer’s product literature completely describing conductors and cable assembles and evidence of U.L. Listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver conductors and cable assemblies to the project in the manufacturer’s standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.

B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.

C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar material.

B. Acceptable manufacturers shall be as listed with the material descriptions.

1.8 WARRANTY

A. The material shall be warranted to be free from defect and in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 GROUND RODS

A. Standard ground rods shall be 3/4 inch diameter, 10 foot length, copper clad steel, equal to Thompson Company.

2.2 CONDUCTORS

A. Conductors buried in contact with the earth shall be bare copper, solid for sizes up to No. 6 AWG, concentric lay strand for sizes No. 8 AWG and larger.

B. All other grounding conductors shall be copper conductor, Type THWN 600 volt 90 Deg.C. thermoplastic insulation, green color where available.

2.3 CONNECTIONS

A. All connections made below grade, in inaccessible locations, and all connections and splices in the grounding electrode conductor system shall be made by exothermic weld process equal to Cadweld. Provide polyethylene inspection well covers and lids equal to Erico #T416B.

B. All other connections shall be hydraulically crimped irreversible connectors equal to Thomas and Betts 54000 Series.

C. Connections to cable trays shall be Thomas and Betts 10105 malleable iron mechanical clamp.

D. Connections to domestic cold water piping shall be Thomas and Betts GUV Series copper alloy U-bolt and mechanical clamp.

E. Connections to building structural steel shall be exothermic weld equal to Cadweld.

F. Connections which require flexibility for movement, expansion, or vibration shall be made with flexible flat conductor, multiple strands of 30 gauge copper conductors or equivalent circular mil area to the primary ground conductor. Protect ends with copper bolt hole end pieces.

2.4 CONDUITS

A. Provide malleable iron conduit grounding bushings where:

1. Metallic raceways terminate at metal housings without mechanical and electrical connection to housing.
2. At each end of metallic conductors for grounding conductors where conduits are electrically non-continuous.
3. At the ends of service entrance conduit.

PART 3 - EXECUTION

3.1 GROUNDING ELECTRODE

A. Provide one, or more, driven solid ground rods to serve as the grounding electrode for the facility. Additional rods shall be driven at not less than ten foot separation and connected together until the specified resistance testing criteria can be met.

B. Grounding electrode shall be tested and certified to provide five ohms or less Earth resistivity.

3.2 SUPPLEMENTARY GROUND ELECTRODES

A. The following items, where they exist on the project, shall be bonded together with the main grounding electrode described above:

1. Domestic cold water service entrance.
2. Building structural steel frame.
3. Minimum twenty feet of bare copper conductor, minimum No. 4 AWG, encased in a concrete footing along the exterior perimeter edge of the building.

B. Ground Electrode Bus:

1. Provide a single copper bus bar located adjacent to the service main disconnecting means as the common connection point for the main ground electrode and each supplementary ground electrode.
2. Mount ground bus on suitable wall insulator stand-offs.
3. All grounding electrode conductors shall be permanently connected to this bus with exothermic weld connections.
4. All grounding electrode conductors shall be the same size and shall be not less than the size required by NEC or the size shown on the Drawings.
5. Connect the grounding electrode system to the main ground connection in the U.L. Listed Service Disconnecting means in the main switch or switchboard.

3.3 GROUNDED CIRCUIT CONDUCTOR

A. Bond the grounding electrode system to the grounded circuit conductor (neutral conductor) at one location only, on the supply side of the service disconnecting means, with a neutral disconnecting link as required by the NEC.

3.4 EQUIPMENT GROUNDING CONDUCTORS

A. Bond the non-current carrying parts of the electric power system to the grounding electrode conductor at the service disconnecting means. From this point forward, all non-current carrying parts of the electric power system shall be electrically connected and continuous by means of:

1. Electrically continuous equipment enclosures, metallic boxes and metallic raceways connected with U.L. Listed connectors and couplings.
2. Equipment grounding conductors supplementary to metallic raceway systems where shown on the Drawings.
3. Equipment grounding conductors in non-metallic raceway systems and in flexible metal conduit systems.
4. Where permitted under other sections of the Specification, the insulated grounding conductor provided in Type MC cable will be considered an acceptable equipment grounding conductor.

5. Uninsulated grounding strips and spiral wrap provided in Type AC cable is not an acceptable grounding conductor.

3.5 ISOLATED GROUND SYSTEMS

A. Wiring Devices:

1. Where specifically shown on the Drawings, isolated ground wiring devices may be employed. Where these devices are used, a separate insulated isolated ground conductor shall be provided in the branch circuit wiring, in addition to the equipment grounding conductors described above.
2. Provide isolated ground bus in panelboards which supply branch circuits to isolated ground devices. Isolated ground busses shall be electrically insulated from the panelboard equipment enclosure.
3. Provide an insulated conductor as a bonding jumper inside the panelboard to connect the isolated ground buss to the equipment ground buss in the panelboard. Bonding jumper shall be a minimum of the same size as the equipment grounding conductor for the panelboard feeder, or the size shown on the Drawings.

B. Isolated Ground Systems:

1. Provide auxiliary isolated ground systems as shown on the Drawings for the grounding of specific voice, data, communication systems and for single point reference ground of separately derived systems.
2. These systems shall be extensions of the Grounding Electrode System by means of radial isolated ground conductors from the main ground electrode bus to secondary ground electrode busses located throughout the facility.
3. These systems shall remain insulated from equipment enclosures raceway systems that are a part of the equipment grounding system.

3.6 SEPARATELY DERIVED SYSTEMS

A. Separately derived systems include:

1. Secondaries of dry type power transformer.
2. Outputs of uninterruptible power systems.
3. Outputs of motor generator sets or frequency convertors.

B. These systems shall be grounded in accordance with the NEC, similar to the service disconnecting means discussed above, and as shown on the Drawings.

C. The grounding electrode conductor from a separately derived system shall be connected to the main ground electrode bus described above, or to one of the secondary ground electrode busses, if present.

D. A second grounding electrode conductor shall connect to building structural steel frame at the nearest available location, if available.

3.7 TESTING

A. Grounding Electrode:

1. The earth resistance of the main ground electrode shall be not more than 5 ohms.
2. Perform a measurement of ground resistance by one of the means described in IEEE Standard 81, Guide for Measuring Earth Resistivity.
3. Provide written certification of the ground resistance measurements upon request.

B. Grounding Continuity:

1. Provide continuity tests and checks of equipment grounding and isolated grounding conductor systems to insure electrical continuity.
2. Provide written certification of continuity checks upon requests.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1- General Requirements and related documents.

B. All sections of this Specification.

1.2 DESCRIPTION

A. Work Included: Provide miscellaneous materials for the supporting of electrical material and equipment.

B. Related work specified in other sections:

1. 26 00 00 Electrical
2. 26 05 32 Raceways
3. 26 27 16 Electrical Cabinets and Enclosures
4. 26 05 33 Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Product Data: If materials are by manufacturers other than specified, submit product data giving complete description.

1.5 MANUFACTURERS

A. Listed with Materials.

B. Acceptable Manufaturers

1. Kindorf
2. Unistrut
3. Caddy

PART 2 - PRODUCTS

2.1 MATERIALS

A. Continuous Slotted Channel: #12 gauge steel, electrogalvanized, with zinc chromate, bases and dimensions as required for application.

B. Hanger Rods: Continuous thread, electrogalvanized, with zinc chromate, sizes as required for loads imposed.

C. Hex Head Cap Screws and Nuts: No. H-113 and No. H-114, respectively.

D. One-Hole Pipe Straps: Series HS-100, galvanized steel

E. Single Bolt Channel Pipe Straps: Steel, with machine screws and nut, Series C-105 and Series C-106.

F. Lay-In Pipe Hanger: Series C-149.

G. Conduit and Pipe Hanger: Series 6H.

H. Beam Clamps: Series 500, RC, EC, and PC for applications.

I. Concrete Inserts, Spot: Series D-256 or No. D-255.

J. Concrete Inserts, Channel: Series D-980 or Series D-986.

K. Riser Clamps: Series C-210.

L. Cable Supports: O-Z/Gedney Type S.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Carefully lay out and provide concrete inserts.

B. Securely fasten and support conduits and raceways to the building structure.

C. Suspend horizontal runs of conduit and raceways from the floor and roof construction by rod hangers spaced 10 feet on less on centers for sizes 2-1/2 inches and greater and 9 feet or less on centers for sizes 2 inch and smaller.

D. Fasten single runs of conduit to the structure with one-hole pipe straps and beam clamps or hang on rod hangers.

E. Support multiple runs of conduit and raceways from continuous channel inserts or from trapeze hangers constructed of rod hangers and channels.

F. Fasten single conduits to rod hangers with adjustable lay-in pipe hangers or for 2 inches and smaller conduits with Series 6H pipe hangers.

G. Fasten conduits to channels with pipe channel straps.

H. Support conduits and raceways within 3 feet of each end of each bend, of each termination, and at other intervals to maintain horizontal and vertical alignment without sag and deformation.

I. Do not use cable, strap, and wire hangers as fasteners.

J. Provide riser clamps for conduits at floor lines. Provide wire and cable supports in pull boxes for risers in accordance with NEC Section 300-19 and Table 300-19 (a).

K. Install supports to permit equally distributed expansion and contraction of conduits and raceways with expansion joints. Use guides or saddles and U-bolts and anchors designed for equal effectiveness for both longitudinal and transverse thrusts.

L. Do not support conduits and raceways for equipment connections.

M. Provide special supports with vibration dampers to minimize transmission of vibrations and noises.

N. Provide trapeze hangers for conduits and raceways where routing interferes with ducts

O. Provide hangers, racks, cable cleats and supports for wires and cables in cable chambers and other locations to make a neat and substantial installation.

P. Provide angle iron and channel supports to the floor and structure for panelboards, cabinets, pull and junction boxes. Support independently from entering conduits and raceways. Provide supports as specified for conduits and raceways for outlet boxes and pull boxes 100 cubic inches and smaller.

Q. Provide supports sized for the ultimate loads to be imposed.

3.2 CLEANING

A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 05 32

RACEWAYS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide a mechanically and electrically complete conduit system.

B. Related work specified in other sections:

1. 26 00 00 Electrical
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 05 29 Hangers and Supports for Electrical Systems
4. 26 05 23 Control Voltage Electrical Power Cables

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Samples: Provide samples upon specific request.

B. Product Data: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and installation methods.

C. Certificates:

1. Labels of Underwriters' Laboratories, Inc. affixed to each item of material.
2. If materials are by manufacturers other than those specified submit certification that material meets applicable Underwriters' Laboratories, Inc. Standards.
3. Labels of ETL Verified PVC-001 affixed to each PVC Coated Galvanized Rigid Conduit.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect conduits and finishes from damage.

1.6 MANUFACTURER

A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar equipment.

B. Acceptable Manufacturers

1. Metallic Conduits: Allied, and Wheatland.

2. Nonmetallic Conduits: Cantex, and SEDCO.
3. PVC Coated Metallic Conduits: Plastibond, Permacote, and Korkap.
4. Others: As listed with products.

1.7 WARRANTY

A. The materials shall be warranted to be in proper working condition for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Metal Electrical Conduit: Hot-dipped galvanized steel with zinc coated threads and an outer coating of zinc bichromate, complete with one coupling and one end thread protector. Intermediate metal conduit (IMC) is not allowed.

B. Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing.

1. Conduit for power wiring shall be natural electro galvanized.
2. Conduit for other systems shall be color coded in accordance with Section 26 05 23 - Control Voltage Electrical Power Cables.

C. Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with integral copper ground wire on sizes 1-1/4" and smaller.

D. Liquidtight Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with extruded polyvinyl jacket.

E. Rigid Nonmetallic Electrical Conduit: Schedule 40 heavy wall polyvinylchloride, high impact resistant.

F. PVC Coated Galvanized Rigid Conduit: The PVC coated galvanized rigid conduit must be UL Listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standard may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.

G. Elbows and Bends:

1. All Types: Size 1-1/4 inch and larger shall be factory manufactured.

H. Bushings:

1. 1-1/4" and Smaller: Same material as the conduit with which they are installed.
2. 1-1/2" and Larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150 Deg.C.

I. Locknuts:

1. 1-1/2" and Smaller: Zinc plated heavy stuck st eel, O-Z/Gedney.
2. 2" and Larger: Cadmium plated malleable iron, O-Z/Gedney.

J. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney.

K. E.M.T. Compression Connectors: Gland compression type, zinc plated steel body, cadmium plated, malleable iron nut, insulated throat, O-Z/Gedney.

L. E.M.T. Compression Couplings: Gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney.

M. Liquidtight Conduit Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally cast external ground lug, O-Z/Gedney.

N. Seals for Watertight Wall and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney.

O. Seals for Penetrations through Existing Walls: Thunderline Corporation Link-Seal watertight sleeves, complete with wall and casing seals.

P. Fire Seals: Galvanized iron pipe sleeves sealed with approved foam type fireproofing.

Q. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers selected for linear or linear with deflection, as required.

R. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10.

S. Accessories: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron on the forms and dimensions best suited for the application.

T. Identifying Tape for Underground Conduits: Polyethylene tape, 6 inches wide, with continuous printing along length, Brady Identoline:

1. For Electric Power Conduits: Yellow with black letters.
2. For Other Services: Green with black letters.

U. Sleeves: 22 gauge galvanized steel sleeves where conduits pass through walls and floors. Standard galvanized steel pipe where conduits pass through beams, outside walls, or structural members.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to which conduits are to be secured for:

1. Defects which will adversely affect the execution and quality of work.
2. Deviations from allowable tolerances for the building material.

B. Do not start work until defects and deviations are corrected.

3.2 INSTALLATION

A. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be drawn into conduit. Do not use conduit sized less than 3/4" unless specified otherwise.

B. Conceal conduits from view in all areas except mechanical and electrical equipment rooms and crawl spaces. Should it appear necessary to expose any conduit:

1. Bring to the attention of the Architect, immediately, and
2. Rearrange the work to facilitate an approved installation.

C. Install all conduits at elevations and locations to avoid interference with grading of other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry units.

D. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure.

E. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.

F. Ream, remove burrs, and swab inside conduits before conductors are pulled in.

G. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.

H. Bends and offsets in 1" and smaller conduits may be done with approved bending devices. Do not install conduits which have had their walls crushed and deformed and their surface finish damaged due to bending.

I. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for the application.

J. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.

K. Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs where exposed to damp or wet locations.

L. Connect and couple E.M.T. with compression type fittings. Do not use indentor and set screw fittings.

M. Install and neatly rack exposed conduits parallel with and perpendicular to the building walls. Do not install exposed diagonal conduit runs.

N. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices in accordance with the National Electrical Code.

O. Do not run conduits exposed on the roof unless approval is obtained prior to installation.

P. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".

Q. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, and other equipment and devices which are subject to vibration and which require adjustment with flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection.

R. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire sealing materials on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors.

S. Conduit sleeves shall be sized to permit insertion of conduit with adequate clearance for movement due to expansion and contraction. Where conduits pass through outside walls, watertight fittings, as specified herein, shall be used.

T. Provide pullstring in each empty conduit. Label pullstring when conduit termination is not obvious.

3.3 USES PERMITTED

A. Rigid Metal Conduit:

1. Exterior conditions above grade.
2. Interior wet or damp locations.
3. Hazardous locations.
4. Mechanical equipment rooms.
    a. Sizes 2” and larger.
5. Lower Level of the building.
    a. Sizes 2” and larger.

B. Schedule 40 PVC with concrete encasement:

1. Below grade exterior to the building.

a. Electric Services.
b. Communications Services.
c. Sizes 2” and larger.

C. Schedule 40 PVC without concrete encasement:

1. Below grade interior to the building.

a. Electric services below floor slab.
b. Communications services below floor slab.

2. Below grade exterior to the building.

a. Sizes 1-1/2” and smaller.

D. Electrical Metallic Tubing:

1. All uses above grade interior to the building, except as limited elsewhere in this section.

E. Steel Armor Clad Cable:

1. Concealed in walls and above ceilings.
2. Final connection from junction boxes on structure to individual light fixtures. Fixture-to-fixture wiring not permitted.
3. Home runs from first junction box to panelboards shall be EMT.

F. Flexible Metal Conduit:

1. Final connection to vibrating or adjustable equipment.
2. Connection to vibrating equipment shall contain one 90 degree bend.

G. Liquid tight Flexible Metal Conduit:

1. All uses permitted for flexible metal conduit.

a. In damp or wet locations.
b. Exterior to the building.
c. Food service areas.

END OF SECTION

SECTION 26 05 33

BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCE DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all of the Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide outlet boxes for the installation of wiring devices, lighting fixtures, and power and control connections.

B. Related work specified in other section:

1. Electrical: Section 26 00 00
2. Wiring Devices: Section 26 27 26
3. Lighting: Section 26 51 00
4. Control Voltage Electrical Power Cables: Section 26 05 23

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Samples: Provide samples upon specific request.

B. Product Data: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and electrical ratings.

1.5 MANUFACTURERS

A. Listed with Materials.

1. Appleton Electric Company
2. Raco
3. Steel City
4. Crouse Hinds
5. Hubbell
6. Raceway Components
7. Walker

PART 2 - PRODUCTS

2.1 MATERIALS

A. Flush Mounted Outlet Boxes: Standard, stamped galvanized steel with factory conduit knockouts, one piece and welded construction:

1. Series 4S and 4S0 square boxes with covers.
2. Series M1, M2, M3 - 250 and Series M1, M2, M3 - 350 masonry boxes with covers.
3. Series 2G and GC-5075 switch boxes with covers.
4. Series OCR concrete rings with Series OCP and OCP-3/8 back plates.
5. Series 40 and 40D octagonal boxes with raised covers.
6. Series SX expandable bar hangers.

B. Surface Mounted Outlet Boxes: Cast metal with threaded hubs. Type FS and FD of form suited to the application.

C. Fire Rated, Flush, Poke-Thru Outlets: Raceway Components, Inc. #RC-700A.

D. Fire Rated, Flush, Poke-Thru Outlets with Conduit Adapter: Raceway Components, Inc. #RC-700-6-A.

E. Floor Outlet Boxes: Hubbell cast flush floor boxes, fully adjustable with flush service fitting, and carpet flange (if required).

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine building structure to which outlet boxes are to be secured for defects which affect the execution and quality of work.

B. Do not start work until defects are corrected.

3.2 PREPARATION

A. Carefully measure and lay out exact locations in conference with the Construction Manager.

B. Owner may change outlet box locations a distance of 5 feet before rough-in without additional cost.

3.3 INSTALLATION

A. In dry walls for single and two gang outlet provide 4S and 4D boxes; for 3 or more outlets use masonry boxes.

B. In poured concrete floors, provide cast flush floor boxes complete with service fittings and carpet flanges (if required).

C. In block and masonry walls provide masonry boxes of depths required for wall thickness.

D. In poured concrete and plastered walls provide 4S and 4D boxes for single gauge outlets and 2G and 3G-5075 boxes for multiple ganged outlets.

E. In concrete ceiling provide OCR rings.

F. In other ceilings provide 40 and 40D boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.

G. In exposed work, exterior of the building, in wet locations, and flush in non-waterproofed walls below grade provide FS and FD boxes.

H. Submit for approval special boxes for special devices and applications. Size according to device and application in accordance with NEC.

I. Install outlet boxes finished to within 1/8 inch of finished surfaces.

J. Install center of box at heights above finished floor:

1. Wall Switches: 45 Inches
2. Convenience Outlets: 18 Inches
3. Telephone/Data Outlets: 18 Inches
4. Wall Telephone Outlets: 45 Inches
5. Boxes Indicated Above Counters: 4 Inches above backsplash and trim, unless otherwise indicated.

K. Install wall switch outlet boxes on the strike side of doors as finally hung.

L. Group outlet on circuits with homeruns as indicated on the Drawings.

M. Do not provide through-the-wall and back-to-back boxes unless specifically noted on the drawings.

N. Provide standard manufactured plugs in unused openings of boxes.

O. Provide boxes at the terminal of conduit runs to outlets and devices.

P. Provide plaster rings and covers where required by the building structure.

Q. In brick finished walls, locate to work brick in a brick course where possible, and to permit conduits and raceways to enter from the rear without cutting brick, where possible.

R. Provide 3/8 inch studs and lighting fixture outlet boxes where shop drawings of fixtures require and elsewhere as may be required for fixtures.

S. Rigidly attach to structure and ceiling supporting members in suspended ceilings to avoid cutting mechanical ceiling members.

T. Center outlet in paneling and in other Architectural features.

U. Locate light fixture outlets in uniform relation with ceiling tiles.

V. Label all junction boxes with circuit information as to its use for special system equipment. Use an indelible marker to mark information on cover.

3.4 CLEANING

A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 REFERENCE DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all of the Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide identification of electrical equipment.

B. Provide identification of over current devices.

C. Provide identification of branch circuits, outlets, and wiring devices.

D. Provide identification of required clear working spaces for electrical equipment.

E. Provide identification of rooms and spaces for access by qualified personnel.

F. Related work specified in other section:

1. Section 26 05 33: Boxes for Electrical Systems.
2. Section 26 22 13: Low Voltage Distribution Transferences.
3. Section 26 24 13: Circuit Breaker Distribution Switchboards.
4. Section 26 24 16: Panelboards.

1.3 QUALITY ASSURANCE

A. Signs and plackards shall meet the requirements by OSHA.

1.4 SUBMITTALS

A. Submit literature describing all signage and marking materials to the Architect for approval prior to installation.

PART 2 - PRODUCTS

2.1 PLACKARDS

A. Plackards shall be engraved phenolic name plates with engraved lettering engraved. Lettering shall be minimum 24 point type in basic block font.

B. Plackards shall be securely and permanently adhered to the equipment enclosures without fasteners or penetrations into the enclosures.

C. Plackards shall be color coded for various systems as follows:

1. Utility Power Systems: White plackard, black lettering.
2. Generator Power Systems: Red plackard, white lettering.

3. UPS or UPS-A Systems: Gray plackard, white lettering.
4. UPS-B Systems: Brown plackard, white lettering.
5. Other Systems: As directed by Owner.

2.2 LABELS

A. Labels shall be typewritten, adhesive backed printed labels. Lettering shall be minimum 18 point type in basic black font.

2.3 MARKING MATERIALS

A. Materials for marking of required working clearance shall be adhesive backed yellow tape, equal to 3M Company 471 Series. Clean and prepare floor surface in accordance with manufacturer's instructions.

2.4 SIGNAGE

A. Signage for electrical equipment rooms shall be preprinted manufactured sign units providing warning of the Danger of Electrical Equipment Hazards and limiting access to Qualified Personnel only.

B. Signage shall be securely and permanently adhered to the door surface without fasteners or penetrations into the door surface.

C. All signage shall be approved by the Architect prior to installation.

PART 3 - EXECUTION

3.1 SERVICE ENTRANCE EQUIPMENT

A. Provide a plackard for each service entrance equipment identifying

1. The name of the equipment.
2. The data of installation.
3. The utility company available fault current.
4. The supply system voltage.
5. The name of the engineering company of record for the project.
6. The number of service disconnecting means associated with this service.
7. The name and locations of any other service entrance equipment on the property.

B. Provide each service disconnecting means, switch or circuit breaker with a plackard identifying the device as "Service Disconnecting Means X of X Devices."

1. Utility source disconnecting means.
2. PV Source disconnecting means.
3. Wind power source disconnecting means.

C. Provide Feeder Protective Devices with a plackard identifying the name of the device or circuit number and the name of the equipment or load served.

3.2 DISTRIBUTION SWITCHBOARDS AND PANELBOARDS

A. Provide each switchboard and panelboard with a plackard identifying.

1. The name of the equipment.
2. The supply system voltage.
3. The name of the equipment supplying the switchboard or panelboard.
4. The circuit number of the overcurrent device supplying the switchboard or panelboard.

B. Provide each feeder protective device with a plackard identifying the name of the device or circuit number and the name of the equipment or load served.

3.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Provide each panelboard with a plackard identifying:

1. The name of the equipment.
2. The supply system voltage.
3. The name of the equipment supplying the switchboard or panelboard.
4. The circuit number of the overcurrent device supplying the panelboard.

B. Provide each panelboard with a typewritten circuit directing card describing the name of the load served and the room number (3) where the devices are located. Reference the room number(s) actually installed at the project, not the room numbers for Architectural construction documents.

3.4 LOW VOLTAGE DISTRIBUTION TRANSFORMERS

A. Provide each transformer with a plackard identifying:

1. The name of the equipment.
2. The name of the supply source equipment and protective device circuit number.
3. The supply system voltage.
4. The load systems voltage.
5. The name of the equipment supplied from the load side of the transformer.

3.5 MEDIUM VOLTAGE DISTRIBUTION TRANSFORMERS

A. Provide each transformer with a plackard identifying:

1. The name of the equipment.
2. The name of the supply source equipment and protective device circuit number.
3. The supply system voltage.
4. The load systems voltage.
5. The name of the equipment supplied from the load side of the transformer.

3.6 OTHER EQUIPMENT

A. Provide other electrical and mechanical equipment with plackards identifying.

1. The name of the equipment.
2. The name of the supply source equipment.
3. The circuit number of the overcurrent device supplying the equipment.

3.7 OUTLET BOXES, JUNCTION BOXES AND WIRING DEVICES

A. Provide labels affixed to the inside cover for each outlet box, junction box, and wiring device identifying the panel name and branch circuit numbers for the overcurrent devices supply the circuits.

3.8 REQUIRED WORKING CLEARANCES

A. Provide marking on the floor around each item of equipment defining the required working clearances in accordance with the National Electrical Code.

3.9 ELECTRICAL EQUIPMENT ROOMS

A. Provide each entry door into a room or space containing electrical power distribution equipment providing Warning of the Electrical Hazard and restricting entrance to Qualified Personnel only.

END OF SECTION

SECTION 26 05 73

ELECTRIC POWER SYSTEM ANALYSIS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

1.2 DESCRIPTION

A. Provide a computer based fault current study utilizing industry accepted standards, practices, and analysis tools.

1. Equipment with interrupting or withstand ratings of less than the available fault current shall be identified.
2. Equipment which requires series ratings of components in order to provide adequate interrupting ratings shall be identified.

B. Provide a computer based overcurrent protective device coordination study utilizing industry accepted standards, practices, and analysis tools.

1. Components which cannot achieve full coordination shall be identified.
2. Adjustable protective devices shall be set based on the results of the study.
3. Replaceable protective devices including fuses shall be verified to be the value, rating and speed required based on the results of the study.

C. Provide a computer based arc flash hazard analysis of the electrical distribution system equipment utilizing industry accepted standards, practices and analysis tools.

1. Provide and install arc flash hazard warning labels as specified on equipment enclosures.

D. For new facilities, the scope of the system shall include the equipment shown on the one-line power diagram, specified feeder types, and equipment and devices as described in the approved equipment submittal drawings. Feeder lengths shall be appropriately estimated from scale floor plan drawings.

1. The Owner shall provide a one-line power diagram completely illustration the system or portions of the system to be included in the analysis.
2. The Owner shall provide copies of the approved submittal drawings or approved operating and maintenance manuals completely describing the equipment and component devices with electrical ratings, manufacturer, and model numbers.

E. For existing facilities the scope of the system shall be ascertained by field survey of the existing system, to include the equipment listed below as may be present on the particular site.

1. Device manufacturer, type, and ratings shall be determined by field survey.
2. Feeder sizes and types shall be determined by field survey.
3. Feeder lengths shall be appropriately estimated by field dimensions.
4. Provide the services of qualified field technical personnel to operate, de-energize and record data which may not be readily observable.
5. Obtain the Owner’s permission to de-energize equipment as required and perform those activities on times and dated specified by the Owner.

1.3 QUALITY ASSURANCE

A. All elements of the studies and analysis shall be performed under the direct supervision and control of a Professional Electrical Engineer licensed in the state where the project is located.

B. The Professional Engineer shall be experienced in the application of the software employed for a period of not less than three years, and shall be able to provide evidence of having performed successful studies of similar magnitude and complexity for electrical distribution systems employing similar devices.

1.4 REFERENCED STANDARDS

A. IEEE 399 - Recommended Practice for Industrial and Commercial Power Systems Analysis.

B. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

C. IEEE 1584 - IEEE Guide for Performing Arc Flash Hazard Calculations.

1.5 DELIVERABLES

A. Provide two bound copies of complete study and analysis including:

1. Single line power diagrams of the electrical power distribution system utilizing nomenclature consistent with the study input data forms.
2. Fault Current Study:
    a. Study input data in tabular form.
    b. Fault current available at each bus or item of equipment, listed in tabular form.
    c. Required equipment fault current ratings at each bus or item of equipment, listed in tabular form.
    d. A listing of all components for which the fault current available exceeds the equipment fault current ratings.
3. Coordination Study:
    a. Coordination study time current curves on log-log axis graphs.
    b. A listing of all components for which clear coordination cannot be achieved.
    c. A listing of all components which are not protected within their component ratings.
    d. Pickup and time delay settings for all adjustable devices in tabular form.
    e. Fuses elections, ratings and speeds for all replaceable protective devices.
4. Arc Flach Hazard Analysis:
    a. A listing of the flash protection boundary, incident energy, working distance and hazard risk category for each item of equipment in tabular form.
    b. Copies of all Arc Flash Information labels provided for the facility.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Subject to compliance with requirements, companies offering computer software programs that may be used in the Work included, but are not limited to, the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA, Inc.
4. Operation Technology, Inc.
5. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include “mandatory”, “very desirable”, and “desirable” features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagraming time-current-characteristics curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

D. Computer software shall be capable of printing Arc Flash information labels for installation on facility electrical equipment enclosures.

2.3 ARC FLASH LABELS

A. Arc flash labels shall be printed on self-adhesive durable material resistant to fading, moisture, or peeling.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective submittals, input and output data, and recommended device settings.
2. Impedance of utility source of supply.
3. Electrical Distribution System Diagram:
    a. Circuit breaker and fuse current ratings and types.
    b. Relays and associated power and current transformer ratings and rations.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R rations.
    d. Generator kilovolt amperes size, voltage, and source impedance.
    e. Feeders: Conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.
4. Data sheets to supplement electrical distribution system diagram, cross-reference with tag numbers on diagram, showing the following:
    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company’s overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.

h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ration for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in ampere rms symmetrical.
k. Motor controller ratings including reduced voltage types, variable frequency drive ratings, and motor controller bypasses.

3.2 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at busses and at circuit breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. Service main equipment.
2. Switchgear and switchboards.
3. Transformers.
4. Distribution switchboards.
5. Distribution panelboards.
6. Motor-control centers
7. Motor starters and controllers
8. Branch circuit panelboards

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Show calculated X/R rations and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

E. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1.2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to ½-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.3 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.

b. Self-cooled, full load current or forced-air-cooled, full load current, whichever is specified for that transformer.

2. Device settings shall protect transformers from fault currents.

C. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA-P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

D. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.
b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exits between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.
b. Voltage and current ration for curves.
c. Three-phase and single phase damage points for each transformer.
d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault current cutoff point.

E. Provide completed data sheets for setting of overcurrent protective devices.

3.4 ARC FLASH HAZARD ANALYSIS

A. Perform an arc flash hazard analysis for the electric power distribution system at each of the following:

1. Service main equipment
2. Switchgear and switchboards
3. Transformers
4. Distribution switchboards
5. Distribution panelboards
6. Motor control centers
7. Motor starters and controllers
8. Branch circuit panelboards

B. Arc flash hazard labels shall be provided and be installed on each item of equipment and shall include the following:

1. "Arc Flash Information" banner
2. Flash protection boundary in inches
3. Incident energy in Ca1/Cm2
4. Working distance in inches
5. PPE Category per NFPA 70E
6. Shock hazard when cover is open
7. Limited approach in inches

8. Restricted approach in inches
9. Prohibited approach in inches
10. Equipment name
11. Arc flash study date

END OF SECTION

SECTION 26 09 26

OCCUPANCY SENSOR LIGHTING CONTROLS SYSTEMS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide and install occupancy sensor lighting controls as shown, scheduled, and specified for interior lighting.

B. Related work specified in other Sections:

1. 26 00 00 Electrical
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 95 32 Raceways
4. 26 05 33 Raceway Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

A. Submittals shall include, but not be limited to, the following:

1. Product data on all occupancy sensor lighting control system components and accessories.
2. Reflected ceiling plan drawings showing specific locations of occupancy sensors for lighting control including lines delineating sensor effective range, with and without furniture system partitions, sensor type, sensor mounting, and other pertinent data to allow evaluation of the proposed system.
3. Wiring diagrams for occupancy sensors, related control units, and override switches.
4. Make submittals in accordance with Division 01.
5. Submit factory approved occupancy sensor layouts.

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver devices and cover plates in manufacturer’s sealed unopened packages and protect from the introduction of dust and moisture.

B. Do not install sensors and cover plate until adjacent finishes are complete and the area has been cleaned to a dust free dry environment.

1.6 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturer

1. Leviton
2. Wattstopper
3. Novitas
4. Sensor Switch

1.7 WARRANTY

A. Provide a five year parts and one year labor warranty on occupancy sensor lighting controls. Warranty coverage shall begin at the time of Project Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide a complete and operable occupancy sensor lighting control system in enclosed areas shown on the Drawings. Sensors shall be designed to turn room lighting "on" immediately upon sensing a room occupant, unless specified or noted otherwise, and to turn room lighting "off" if no room occupant is sensed for the entire period of the sensors off time delay, regardless of the shape of the room. Wall mounted sensors shall have the same functions as ceiling mounted sensors, except that lighting turn-on may be automatic or manual.

B. Occupancy sensor lighting control shall include, but not be limited to, all required sensors, transformers, interface controls and relays, wiring, and bypass switches.

C. Sensor Requirements:

1. Sensors shall have built-in timing and load control driving circuitry. Housings shall be white impact resistant plastic.
2. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction in coverage shall occur when air conditioning or heating fans are operating or if sensor has turned off due to not sensing occupants.
3. All sensors shall have easily accessible, user-adjustable controls for adjusting sensitivity of a sensor to its controlled area, and for adjusting "time to light off" delay. Time delay shall be made settable down to 5 minutes. Sensors must also include a time delay adjustment of one minute or less for sensor operation testing. Adjustment controls shall be recessed in order to limit tampering.
4. Sensors shall be able to be wired in parallel to allow coverage of large areas.
5. All ceiling sensors shall have pig-tailed plenum cable connectors for installation in plenum ceiling spaces.
6. All ceiling sensors shall be low voltage, have a rugged solid state design, and be designed and manufactured specifically for control of lighting for energy conservation.
7. All sensors shall be manufactured by the same company and shall be aesthetically compatible; i.e., from the same product line or generation of products.
8. Where light fixtures are specified to have energy saving electronic ballasts, sensors shall be suitably compatible.

2.2 SCHEDULE OF OCCUPANCY SENSOR LIGHTING CONTROLS

A. Sensors: Occupancy sensors shall be provided as required to suit the applications on the project. Typical sensor types shall include:

1. Type 1: Leviton Model #OSC20-MOW or approved equal, ceiling mount multi-technology occupancy sensors for rooms where ceiling height does not exceed 12'. Unit shall be ceiling mounted, wide range types with minimum 2,000 square feet of coverage. Unit to be placed as close to center of room as possible unless other equipment prevents center location. In rooms larger than 1,800 sq. ft., two or more units shall be located with 30% overlap in coverage to provide complete room coverage.

2. Type 2: Leviton Model #OSW12-M0W or approved equal, wall mount multi-technology occupancy sensors for rooms where ceiling exceeds 12'. Unit shall be wall mounted and placed at an 8' to 10' mounting height in a corner such that the unit will not detect motion through the doorway. Unit shall be wide range type with minimum 1,200 square feet coverage.
3. Type 3: Leviton Model #OSSMT-MD or approved equal wall box occupancy sensors mounted 48" A.F.F. Unit shall be dual-Technology, PIR and Ultrasonic.

B. Control/Switching Units: Control units shall be an integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low-voltage power to a minimum of three sensors. Control unit relays and features shall be as follows:

1. Relay contacts shall have ratings of:

   a. 20A - 120 volts ac incandescent.
   b. 20A - 120 volts ac ballast.
   c. 20A - 277 volts ac ballast.
   d. 2HP – 240 volts.

2. Relay contacts shall be isolated.
3. Wiring between sensors and control units shall be three conductor, 18 AWG, stranded UL classified, teflon-jacketed, and plenum-rated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install occupancy sensor lighting controls as required and where indicated, in accordance with manufacturer's written instructions and project shop drawings, applicable requirements of NEC, and recognized industry practices to ensure that products serve intended function.

B. Sensor Design and Layout:

1. It shall be the equipment manufacturers'/ contractors' responsibility to provide the quantity of sensors required for complete and proper coverage without gaps within the range of coverage of controlled areas. Rooms shall have 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room. The locations and minimum quantities of sensors shown on the Drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The equipment manufacturer/contractor shall provide additional sensors if required to properly and completely cover the respective room. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.
2. Exact locations of control unit hardware boxes shall be based on observing good installation practice and shall be coordinated with other elements of the reflected ceiling plan. Control unit hardware shall be fully concealed.

C. Box Condition: Install low voltage lighting control devices only in electrical boxes which are clean, free from excess building material, debris, and similar matter.

D. Wiring:

1. All branch circuit wiring shall be installed in an approved raceway.
2. Low voltage wiring shall be installed in an approved raceway where concealed in inaccessible locations or exposed. Where low voltage wiring is concealed in accessible ceiling plenums, it may, at the Contractor's option, be routed without a raceway using air plenum rated multiconductor cable. All control wiring shall be minimum 18 gauge stranded copper.
3. All low voltage wiring shall be color coded and identified or tagged at terminals to assist with future maintenance.

E. Sensor Testing and Adjustment: At the time each sensor is installed, it shall be adjusted as follows:

1. Sensitivity shall be adjusted for proper occupant detection appropriate to the usage of the room.
2. Set time delay at approximately 6 minutes after setting in 30 second test to verify sensor/control unit operation.
3. Check indicator light of each sensor to verify that occupancy is being detected in the range desired.
4. Sensor operating frequencies shall be selected to select interference with other units in the vicinity as required.
5. Ensure that there are no obstructions which could block proper sensor coverage, thereby minimizing the sensor detection zone.
6. Occupancy sensors may be affected by various conditions in the room. It may be necessary for the Contractor to make adjustments, change the location or type of sensor to obtain proper operation in a specific room. The Contractor/equipment manufacturer shall have final responsibility for proper operation and coverage of the system in each room and should therefore make labor allowance for such changes and adjustments. The Contractor is also responsible for acquiring approval from Engineer for any changes or deviations from project specifications.

F. Bypass Switches: Install line voltage bypass switches in room line voltage wiring for all rooms with ceiling mounted sensors and control/switching units. Switches shall be series wired with control/switching units to provide positive off control and function as standard on/off switches if the occupancy sensor fails and is bypassed.

3.2 SPARES

A. Provide 10% spare sensors and switch packs of each type used on the project.

B. Deliver spares to the Owner at completion of project.

3.3 DEMONSTRATION/TRAINING

A. Upon completion of testing and adjustment, the Contractor shall demonstrate operation of the system to representatives of the Owner and Engineer.

B. The Contractors shall provide eight hours of instruction the Owner's personnel in proper maintenance, adjustment, and operation of the occupancy sensor lighting controls.

END OF SECTION

SECTION 26 09 27

LIGHTING CONTROL PANELBOARDS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. All sections of this Specification.

1.2 DESCRIPTION

A. Work Included: Provide a complete programmable low voltage relay lighting control system to control all interior and exterior lighting systems.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturers shall have been regularly engaged in the manufacture of low voltage lighting control systems for a period of five years, and shall have had similar systems in successful operation in the area for not less than three years.

B. Source Quality Control:

1. All components shall be listed by Underwriters' Laboratories, Inc.
2. All equipment shall meet the requirements of the National Electrical Code.
3. All equipment shall meet Federal Communications Commission Standards for electromagnetic emissions.

1.4 SUBMITTALS

A. Samples: Provide samples upon request.

B. Shop Drawings: Provide shop drawings indicating equipment cabinet sizes, mounting power requirements and control entries.

C. Product Data: Provide manufacturer's brochures describing all components and each equipment cabinet.

D. One Line Diagram: Provide a one line diagram of the system configuration proposed including typical wiring diagrams for all components.

E. Operation and Maintenance Data: Provide complete operation instructions, programming instructions, recommended spare parts lists, and source of supply for repair components and authorized services and repair.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect all equipment from dust, moisture, and damage throughout the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Low Voltage Switching System Description:

1. The Low Voltage Switching System shall consists of preassembled relay panels, low voltage switches, photocells, and their associated wiring.
2. The relay panels shall be mounted in electrical closets as indicated on the drawings. The numbered relays in the panel shall be wired to control the power to each load as indicated on the Panel Wiring Schedules included in the drawings. All power wiring will be identified with the number of relay controlling it at the load.
3. Low voltage switches shall be mounted in the spaces as indicated on the Lighting Plans. Photocells shall be mounted on the roof facing north. Low voltage wiring from the switches to the relay panel shall be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local standards. Low voltage wiring from the photocell shall be installed in conduit. Each low voltage wire shall be labeled with the relay number (1-48) at each switch or sensor. Use only properly color coded, stranded #20 AWG (or larger) wire. All relays and switches shall be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.
4. The panels shall provide expansion slots for the addition of automation cards. These cards shall be totally compatible with the manual operation of the low voltage switches and photocells; and, in the event of a card failure, these devices shall continue to operate to provide relay control.

B. Hardware Features:

1. Modular Relay Panels shall consist of the following:
    a. Tub: Empty Nema 1 enclosure sized to accept an interior with either 1-24 or 1-48 GE RR9P relays.
    b. Interior: Bracket and circuit board backplane with pre-mounted GE RR9P relays. Interiors shall be sized to accept either 12, 24, 36, or 48 relays and will provide true ON/OFF indication of relay status through LEDs mounted on the circuit board. Each relay be capable of direct ON/OFF control by a low voltage switch or occupancy sensor. RR9P relays shall be momentary-pulsed mechanically latching contactors rated at 20 amps, 120-277 VAC. They shall attach to the Interior by a single plug-in connector.
    c. Power Supply: Transformer assembly with two 40VA transformers with separate secondaries; one providing power to relays, LEDs, and associated low voltage switches and sensors, the second providing power to optional automatic cards. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against powerline spikes. 277 VAC, 50/60 Hz. +/- 10%.
    d. Cover: Hinged, lockable configuration. Surface Hinged Locking Covers shall provide an LED status viewing window and a lockable door for access to Low Voltage wiring compartment. A wiring schedule directory card shall be affixed to the rear of the cover to allow ready identification of circuits/relays/loads controlled when the door is open.
2. Switches/Plates:
    a. Provide Specification Grade standard (unlighted) configuration momentary push button type switches at all locations shown on the Plans (with the switch symbol "S", unless otherwise noted), for overriding the relays. Color shall be gray.
    b. Provide matched Specification Grade plates of stainless steel material.
3. Photocells:
    a. General:
        1) All photocells shall be directly compatible with the modular relay panels described above and shall wire directly to same (Class 2 or 2P wiring) without any auxiliary components.
        2) Separate sensitivity and time delay adjustments shall be readily accessible to the user to simplify set up.
4. Low Voltage Wire:
    a. All low voltage wiring shall be color coded to match the relays, and switches. It must also be UL listed as conforming to Class 2 or Class 2P wiring requirements.

b. Switch color codes as follows:

Red/Black/White
Red/Black/White/Yellow (pilot)
Red/Black/White/Blue (locator)

c. Remote relay color coding

Red/Black/Blue/Yellow/Yellow

5. Dataline:

a. Contractor shall provide for future addition of intelligence networking by providing a dataline between all panels and terminating same in a J-box in the operator's office.
b. Dataline shall be 18/2 twisted pair (Red = +, Black = -) with shield. Rated for Class 2P. 1 turn per inch, minimum; 50 pf/ft. max.
c. Maximum dataline length = 4000 ft.

C. Approved Manufacturers:

1. GE or approved equal.
2. GE TLC Catalog Numbers

a. Lighting Automation Panels (Modular Relay Panel):
RTUB24, RTUB48, RINTERxx24, RINTERxx48, RR9P, RPWR115, RPWR277, RCOV24xxx, RCOV48xxx
b. Switches and Plates:
RS2-xxx, RP2-xxx, RMP2-35
c. Wire:
Switches:
RSWIRE-x, RSWIRE-xP (plenum rated)
Remotely Mounted Relays:
RRWIRE-x, RRWIRE-xP (plenum rated)
Dataline
RDWIRE-2SP (plenum rated or in conduit)

2.2 LOW VOLTAGE SWITCHING SYSTEM WITH PROGRAMMABLE PANEL INTELLIGENCE

A. System Description:

1. The low voltage switching system defined in Section 2.01A shall not change. Programmable panel intelligence with networking capability shall be provided by means of plug-in controller cards with associated relay input/out cards. These cards will be provided for each relay panel.
2. The panel intelligence cards shall add occupant sensitive scheduling capability for each relay. Individual relays may be programmed to "flick" (blink) five minutes before a scheduled OFF. Individuals pressing the associated low voltage direct wired switch during this period will be exempted from the OFF sweep. In addition, their override may be assigned a time delay of 2 minutes to 24 hours with a flick warning five minutes prior to expiring.
3. The programmable intelligence cards shall also provide for two programmable panel master switches in each panel. These shall be capable of controlling any group of relays within the panel with any of the following scenarios:

a. Master ON/OFF Controls the programmed group of relay ON/OFF sequentially while still allowing direct switch override of each.
b. "Flick" Warn: Provides a "flick" warn prior to OFF similar to the schedule operation described above.

c. Cleaning: Allows a switch to turn the programmed group of relays ON for cleaning or other non-priority tasks, but won't allow those same relays to be turned OFF if the area is occupied (ON by schedule or occupant override).
d. Photocell/Shed: Relays in this programmed group will track the operation of the photocell or demand shed input if the area is occupied (relay turned ON by schedule event or occupant). If the area is unoccupied, the relay will remain OFF. The occupants of such spaces will be able to exempt their area from the shed function for the day.

4. The controller cards shall also store the current status of all relays, how that status was initiated, and historical runtime data for management analysis.
5. Each controller card shall support two communications ports...an RS232 port and a dataline port. Either or both may be used for programming, monitoring, and control. (The dataline port requires a central access RLINK for communications to an offline PC or modem.) All changes of relay state shall also be communicated over both ports to support interactive graphics and online status monitoring.
6. All programming shall be offline on an IBM PC compatible personal computer with English descriptors of all loads, windows, and help screens. Program data for the panel intelligence shall then be transferred from the PC to the panel with all data transferred confirmed for accuracy. Program data in each panel shall also be transferrable to the PC for editing.

B. Hardware Features:

1. Relay Input/Output cards:

a. Each card shall provide the input/output function for a bank of 12 relays. The smaller relay panels shall accept two cards associated with relays 1-12 and 13-24. The larger panel shall accept up to four cards controlling relay banks 1-12, 13-24, 25-36, 37-48.
b. Each output shall control up to 3 relays in parallel.
c. Inputs shall monitor the status of the associated relay to provide true state indication and the means for confirming all relay control commands as well as monitor direct overrides by switches or sensors.
d. The inputs shall also be capable of monitoring the ON action of the directly connected switch while the relay is ON. (This allows the controller to receive override messages during the flick grace period so that relay may be excluded from the pending OFF sweep.)

2. Controller card:

a. Each controller shall be capable of providing all logic, control, runtime data, status information, and communications functions for all of the relays in a panel up to a maximum of 48.
b. Specific capabilities shall meet or exceed the following:
1) Power loss memory and clock holdup time: 4 days
2) Direct communication port: RS232 port for modem or PC direct communications 300/1200/2400/ 4800/9600/19200 autobaud
3) Dataline Communications: Twisted pair (18/2) dataline with random access and bus arbitration capability of up to 500 panels and no loss of data.
4) Self-diagnostics: Automatic diagnostics on all memory, input/output card modules, relays, and dataline.
5) Direct Overrides: Each relay may be directly overridden by a switch or sensor with state changes monitored by the controller
6) Clock: Digital with time, day of week, and date. Automatic leap year compensation. Programmable Daylight Savings Time and Standard Time adjustment.
7) Schedules:
a) Each controller shall provide up to 24 different operating schedules A-X which may be assigned to individual relays. (Programming a schedule for each relay shall not be acceptable).
b) Each schedule (A-X) shall allow up to 8 events per day for a repeating seven day week.

c) Each schedule shall also provide three "special day" or holiday operating schedules
d) Up to 32 Holidays may be defined for each panel that give the specific date and indicates which of the three special schedules are to be followed on that date.
e) Schedule letters M-X may be updated for all panels by making a single entry at the central PC.

8) Time Delay:
a) Selectable for each relay. 2-1440 minutes.
b) Automatically deactivated during scheduled occupancy.

9) Flick warning:
a) Selectable for each relay. 1-second flick of only those relays which are ON with automatic five minute delay to OFF.
b) Operates automatically for all scheduled OFFs and on time delay overrides.

10) Programmable Panel Master Switches:
a) Two independent inputs (A and B)
b) 2- or 3-wire switch configuration
c) Each programmable for relay group controlled and control scenario (Master ON/OFF, Flick Warn, Cleaning, Shed).

11) Programmable System Switches:
a) Up to 21 per relay in the following groups
Master ON/OFF..... 8
Flick Warn..... 8
Cleaning..... 4
Shed..... 1

12) Telephone Override: Each relay shall respond to up to 8 different telephone override codes.

13) Runtime Counters for Each Relay
a) Cumulative runtime (up to 31 years) and number of cycles (up to 17 million) since last reset. User resettable.
b) Daily runtime for the current day and each of the prior 39 days.
c) Monthly runtime for current and 15 prior months

14) Change of State Enunciation: States for all 48 relays transmitted over both the RS232 port and dataline port within 2 seconds of last change.

3. Operator's PC and Software:

a. All programming and editing to occur offline in the PC.
b. Basic operating software to include the following:

1) Site Wiring Documentation:
a) 20 character English descriptors of all relay loads, panel master switches, programmable system switches, and telephone override codes.
b) Automatic carryover of descriptions to other program/monitor/and control functions

2) Program PC Database: Enter operating data for all panels on the PC database.

3) Display PC Database: Display above

4) RS232 Connect to Lighting Automation Panel:
a) On line with panel for transfer of database to or from panel.
b) Monitor/Control all relays
c) Test all functions

5) Access Codes:
a) Up to 6 different passwords
b) User defines functions accessible for each password (Document, Program, Initialize, Transfer from PC, Transfer to PC, Control, Simulate/Test)

C. Approved Manufacturers:

1. Wattstopper or approved equal.

2. GE TLC Catalog Numbers

   a. Relay Input/Output Cards
      RRDC12
   b. Controller Card
      RCC48
   c. PC
      RLAPTOP-1 with RSOFT-1 software

2.3 DATALINE COMMUNICATIONS

A. System Description:

1. The controllers in each intelligent panel shall be linked over a single dataline. The dataline shall provide a highly reliable communications bus for transferring control and status data to and from the lighting automation panels.
2. The dataline shall have its own power supply which shall also monitor the dataline for faults. It shall provide a clearing current to blow the fuse on any panel which fails in such a manner as to hold the dataline and stop communications.

B. Hardware Features:

1. Dataline shall be 18/2 twisted pair (Red = +, Black = -) with shield meeting Class2P. 1 turn per 3 inches, min. 50 pf/ft. max.
2. Max length...4000 ft.
3. Maximum number of panels on a dataline...500
4. Clearing current...3 amps
5. Power and Fault LED indications

C. Approved Manufacturers:

1. GE or equal.
2. GE TLC Catalog Numbers

   a. Dataline
      RDWIRE-2SP
   b. Power Supply
      RDTPWR

2.4 PROGRAMMABLE SYSTEM SWITCHES

A. System Description:

1. Programmable System Switch modules shall be added to the dataline to provide system wide switching.
2. Each unit shall have an address setting from 01-99 and 16 physical switch inputs. These inputs may be either 3-wire maintained or momentary.
3. The System Switch modules shall transmit the switch ID (address/input) and the action (ON/OFF) whenever a switch changes state.
4. The intelligent panels shall monitor these messages and actuate their associated relays to the appropriate state. This state to be determined by the scenario assigned to the System Switch:
   Master ON/OFF
   Flick Warn
   Cleaning
   Photocell/Shed

B. Hardware Features:

1. Universal power supply
2. 16 independent 3-wire switch inputs
3. 20/3 switch leg wiring, 1000 ft. max
4. Maximum of 1584 programmable system switches per system.

C. Approved Manufacturer:

1. GE or approved equal.
2. GE TLC Catalog Numbers
   RPSS16

2.5 CENTRAL PROGRAMMING, MONITORING, AND CONTROL

A. System Description:

1. A central dataline access port will be supplied to provide central monitoring, programming, and control of all panels as described for a single intelligent panel.
2. Computer:
   a. The computer will be an "AT" class personal computer with an enhanced color graphics display. The system shall be shipped complete with all memory, cables, and peripheral devices. The complete system shall be factory tested prior to shipment.
   b. The complete system shall include:
      1) "AT" class Personal Computer
      2) Color monitor
      3) 3.5" 720K floppy disk
      4) 40 Mbyte hard disk
      5) Mouse
      6) 1200/2400 baud modem
      7) 80 column high speed graphics printer
      8) Lighting controls software and DOS 3.x
      9) Selector switch

B. Approved Manufacturers:

1. GE or approved equal.
2. GE TLC Catalog Numbers
   RLINK, RLAPTOP-1, RDESKTOP-CM, RSOFT-1, R-SOFT-CM, RSOFT-1T, RSOFT-CMT, RSOFT-CMB

PART 3 - EXECUTION

3.1 RELAY CABINET INSTALLATION

A. Mount relay cabinets adjacent to the lighting panelboard to be controlled where possible. Where located over five feet separation, provide wireway with hinged cover for power wiring from panel to relay cabinet.

B. Connect all interior and exterior lighting branch circuits through the relays of the relay cabinet. Observe and maintain proper color coding.

C. Provide circuit directory cards for each panelboard, and provide relay directory card inside the lighting panel identifying circuits which are controlled by relay number.

3.2 SYSTEM STARTUP

A. Manufacturer shall provide a trained technician to confirm proper installation and operation of all system components.

3.3 TRAINING

A. Manufacturer shall provide factory trained application engineer to train owner personnel in the operation and programming of the lighting control system for a period of not less than 16 hours.

3.4 DOCUMENTATION

A. Manufacturer shall provide system documentation including:

B. System one-line showing all panels, number and type of switches and sensors, dataline, programmable system switches, and central PC.

C. Drawings for each panel showing hardware configuration and numbering.

D. Panel wiring schedules

E. Typical wiring diagrams for each component.

3.5 PROGRAMMING

A. Manufacturer shall provide system programming including:

1. Wiring documentation
2. Programmable Panel and System Switch Operation
3. Operating Schedules: These shall be provided on floppy disk compatible with central PC.

3.6 GUARANTEE

A. Guarantee the entire system to be in proper working order for a period of one year following date of final acceptance.

END OF SECTION

SECTION 26 22 13

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for Coordination of work with other portions of the work.

1.2 DESCRIPTION

A. Work Included: Provide low voltage distribution power transformers for the conversion of system voltages.

B. Related Work specified in other sections:

1. 26 00 00 Electrical
2. 26 28 16 Enclosed Switches and Circuit Breakers
3. 26 05 26 Grounding and Bonding for Electrical Systems

1.3 QUALITY ASSURANCE:

A. The equipment provided shall meet the requirements of the National Electrical Code and local codes and ordinances.

B. The equipment provided shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. NEMA ST-20 Dry Type Transformers for General Applications

B. NEMA TP-1 Department of Energy, 10 CFR Part 431 Energy Efficiency

C. UL 1561 Dry Type General Purpose and Distribution Transformers

D. ANSI C57.110 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

1.5 SUBMITTALS

A. Submit manufacturer’s literature describing equipment for each transformer, including:

1. Outline dimensions.
2. Weight.
3. Allowable conduit entry locations.
4. 1/4" scale layout of proposed equipment location including required working clearances and interference with other equipment.
5. Primary and secondary terminal locations.
6. Cable connection lugs and sizes.
7. Nameplate data and phase diagram.

8. Primary voltage, phase, connections and full load current.
9. Secondary voltage, phase, connections, and full load current.
10. KVA rating.
11. Transformer impedance.
12. Designed supports for wall mounted or suspended transformer supports, prepared by a professional structured engineer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store and protect equipment from moisture and dust by storing in a clean, dry, heated space. Provide additional heavy plastic cover to protect the equipment and components. Provide auxiliary heating in the section in accordance with the manufacturer's recommendations.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with manufacture of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company
2. General Electric
3. Eaton, Cutler-Hammer

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. Transformers shall be general purpose dry type ventilated transformers in NEMA 1 enclosures unless specifically noted on the drawings.

B. Transformers shall be of the KVA rating, primary voltage and connection, secondary voltage and connection as indicated on the drawings.

C. All insulating materials shall meet NEMA ST20 standards and be rated for 220 Deg.C. insulation system. Transformers shall be designed for 150 Deg.C. temperature rise and maximum temperature of the top of the enclosure of 50 Deg.C., based on an ambient air temperature of 40 Deg.C.

D. Transformers 25 KVA and larger shall be provided with full rated primary voltage taps, two 2-1/2% below nominal voltage and two 2-1/2% above nominal voltage.

2.2 CONSTRUCTION

A. Coils shall be continuous wound aluminum conductor with windings brazed or welded to line and load terminations. Windings shall be vacuum impregnated with thermosetting varnish.

B. Cores shall be constructed of high grade silicon steel with low hystresis and eddy current losses. The core flux density shall be below saturation point to prevent core overheating. Transformers shall be common core, multiple core construction and Scott-T connections are not acceptable.

C. Enclosures shall be ventilated and fabricated of code gauge steel construction. Entire enclosure shall be finished with a baked polyester powder coat paint finish, ANSI 49 gray. The coating shall be U.L. recognized for outdoor use. All terminals and tap connections shall be accessible by removing a front cover plate.

D. Core and coil shall be bolted to the base of the enclosure by means of rubber vibration isolation mounts.

E. The core of the transformer shall be grounded to the enclosure by a flexible grounding conductor sized in accordance with U.L. and NEC standards.

F. The transformer shall be provided with a name plate giving primary and secondary voltages, full load ampacities, transformer impedance and phaser diagram.

2.3 SOUND LEVELS

A. Sound levels shall not exceed the following:

1. 15 to 50 KVA - 39dB
2. 51 to 112.5 KVA - 44dB
3. 112.5 to 300 KVA - 49dB
4. 301 to 500 KVA - 56dB

2.4 OUTDOOR INSTALLATIONS

A. For outdoor installations, transformers shall be provided with weather shield for NEMA 3R enclosure designation.

2.5 K-RATED TRANSFORMERS

A. Where specifically noted on the drawings, K-Rated transformers shall be rated K-13, shall be provided with 200% neutral bus and neutral conductor terminations, and shall be provided with an independent, full width electrostatic grounded shield between primary and secondary windings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Layout exact locations of transformers maintaining required working access, separation from walls, and adequate space for line and load connections as required by NEC.

B. Transformers shall be floor mounted on four inch concrete housekeeping pads with inserts for anchor bolts.

C. Transformers may be mounted on wall brackets from building structure or suspended from the floor or roof structure above only when supports designed by a professional structural engineer are submitted to the project engineer for approval.

3.2 INSTALLATION

A. Transformers installed in a location where the primary over current device does not comply with NEC requirements for a disconnecting means shall be provided with a heavy duty non-fused disconnect switch or molded case switch in a suitable enclosure.

B. Transformers installed in a location where secondary circuit conductors are in excess of NEC maximum length shall be provided with a heavy duty fused disconnect switch or molded case circuit breaker in suitable enclosure to provide secondary feeder circuit protection.

C. All transformers shall be installed on suitable neoprene vibration isolation pads to minimize transmission of noise to structure.

D. Final connection of raceways to transformers shall be by means of flexible liquid tight metal conduit approximately twelve inches in length incorporating one ninety degree bend to minimize the transmission of vibration to the raceway system.

3.3 GROUNDING

A. Ground transformer secondary to building structural steel or other approved grounding electrode with a grounding electrode conductor in accordance with NEC requirements.

B. Bond the transformer grounded circuit conductor (neutral) to the grounding electrode conductor on the line side of the transformer secondary over current device.

3.4 ADJUSTMENT

A. Adjust transformer primary taps to provide nominal name plate secondary voltages when operating at full demand capacity without over-excitement of the primary winding or over-saturation of the transformer core.

3.5 IDENTIFICATION

A. Provide a permanently affixed engraved nameplate for each transformer giving the transformer name, the source of supply, and the name of the panel or equipment served.

END OF SECTION

SECTION 26 24 13

CIRCUIT BREAKER DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide low voltage distribution switchboards for the distribution of electric power and protection of load feeder circuits.

B. Related work specified in other sections

1. 26 00 00 - Electrical
2. 26 43 13 - Surge Protection Devices

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. ANSI/NFPA 70 - National Electrical Code (NEC).

B. ANSI/IEEE C12.1 - Code for Electricity Metering.

C. ANSI C39.1 - Electrical Analog Indicating Instruments.

D. ANSI C57.13 - Instrument Transformers.

E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

F. NEMA KS 1 - Enclosed Switches.

G. NEMA PB 2 - Deadfront Distribution Switchboards, File E8681

H. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

I. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.

J. UL 50 - Cabinets and Boxes.

K. UL 98 - Enclosed and Dead Front Switches.

L. UL 489 - Molded Case Circuit Breakers.

M. UL 891 - Dead-Front Switchboards.

N. UL 943 - Ground Fault Circuit Interrupters.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment.

P. UL 977 - Fused Power Circuit Devices.

1.5 SUBMITTALS

A. Submit Shop Drawings Including:

1. Front View Elevation
2. Plan View
3. Top View
4. Single Line Diagram
5. Nameplate Schedule
6. Conduit Entry/Exit Locations and Dimensions
7. 1/4" scale layout of proposed location for equipment including required working clearances and interferences with other equipment.
8. Assembly Ratings Including
    a. Main Bus Ratings
    b. Main Lugs or main breaker ratings and location
    c. Voltage ratings
    d. Section Bus Ratings
    e. Ground Bus Ratings and Locations
    f. Short-circuit Ratings
9. Cable Terminal sizes.
10. Switchboard instrument details:
    a. Current transformer data, ratings, accuracy, burden and locations.
    b. Potential connections and location.
    c. Meter descriptive literature and functions.
    d. Control wiring diagrams and field terminal connection locations.

B. Submit manufacturer’s literature describing circuit breakers and trip units for each type and frame employed.

C. Submit manufacturer’s literature for metering equipment, current transformers, potential connections, and wiring diagrams.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and off loaded in accordance with the Manufacturer’s published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Each switchboard section shall be delivered in individual shipping splits for ease of handling. They shall be individually wrapped for protection and mounted on shipping skids.

D. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

E. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

F. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company.
2. General Electric.
3. Eaton.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 SWITCHBOARD - GENERAL

A. Switchboards supplied by building service transformers shall be provided with neutral to ground disconnecting links and U.L. Service Entrance Labels. Provide and install permanent name plate showing date of service and available utility fault current. Obtain available fault current in writing from utility company in project record documents.

B. Short Circuit Current Rating: Switchboards shall be rated with a short circuit current rating as indicated on the drawings, or a minimum of 65,000 A.I.C.

C. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

D. Enclosure: NEMA 1 - General Purpose.

1. Sections shall be completely front and rear aligned. Staggered arrangements are not acceptable.
2. The switchboards shall be of dead front construction.
3. The switchboard frame shall be of formed steel rigidly bolted together to support all cover plates, bussing and component devices during shipment and installation.
4. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
5. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit.
6. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be ANSI #49 medium-light grey, applied by the electro-deposition process over an iron phosphate pre-treatment.
7. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
8. Top and bottom conduit areas shall be clearly indicated on shop drawings.

E. Nameplates: Provide 1" H X 3" W engraved laminated nameplates for each device. Furnish black letters on a white background for all voltages.

F. Bus Composition: Shall be plated aluminum. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans and shall be sized to carry 100% of that ampacity. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus shall not be acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

G. Bus Connections: Shall be bolted with Grade 5 bolts and conical spring washers.

H. Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

I. Accessibility: Accessible from the front only.

2.2 SWITCHBOARD DEVICES

A. Main Breaker

1. Electronic Trip Insulated Case Circuit Breaker

a. Fixed Mounting, Two-Step Stored Energy:

1) Circuit breaker(s) shall have power terminals to accommodate either cable or bolted bus connections.
2) Circuit protective devices shall be two-step stored energy circuit breaker. They shall be UL Listed for 100% continuous current when applied in switchboards. Sensor ampere ratings shall be as shown on the drawings.
3) Provide a fixed instantaneous circuit on breaker(s). The circuit shall have a defeatable instantaneous adjustment to allow the breaker to remain closed for up to 30 cycles during overcurrents below the rms symmetrical short time withstand ratings. The circuit shall instantaneously trip when current levels exceed applicable withstand ratings.
4) Circuit breaker(s) shall utilize a glass reinforced insulating material providing high dielectric strength. Current carrying components shall be completely isolated from the handle and the accessory mounting area. Breaker(s) shall have common tripping of all poles and shall be trip free. The circuit breaker shall be UL Listed for reverse connection without requiring special construction or labeling. The breaker(s) shall have quick-make, quick-break contacts with a maximum 5 cycle closing time. All circuit breakers shall be equipped with electrical accessories as noted on the drawings.
5) Circuit breaker(s) shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.
6) Breaker faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIC ratings.
7) Each circuit breaker shall be equipped with a push-to-trip button to mechanically operate the circuit breaker tripping mechanism.
8) Electronic Trip System

a) The entire trip system shall be a microprocessor-based, true rms sensing design with sensing accuracy through the 13th harmonic, equal to type MICROLOGIC full function trip system.
b) Provide the following time/current curve shaping adjustments to maximize system selective coordination. Each adjustment shall have discrete settings and each function is independent from all other adjustments.
(1) Adjustable Long Time Ampere Rating and Delay
(2) Adjustable Short Time Pickup and Delay (delay includes I^2t IN and I^2t OUT)
(3) Adjustable, Defeatable Instantaneous Pickup (with OFF position)
(4) Adjustable Ground Fault Pickup and Delay (delay includes I^2t IN and I^2t OUT)
(5) High Level Selective Override

9) Circuit breaker shall display phase current of A, B, and C phases and ground fault (when applicable) in real-time. Circuit breaker shall contain trip indicators which shall indicate that the circuit breaker has tripped as a result of over current, short circuit, or ground fault.

B. Branch Circuit Breakers

1. Electronic trip molded case standard function 80% rated circuit breakers.

a. Group mounted through 1200 amperes.
b. Individually mounted above 1200 amperes. Each circuit breaker shall have power terminals to accommodate either cable or bolted bus connections.
c. Electronic Trip System

1) The entire trip system shall be a microprocessor-based, true RMS sensing design with sensing accuracy through the 13th harmonic, equal to MICROLOGIC full function trip system.
2) Provide the following time/current curve shaping adjustments to maximize system selective coordination. Each adjustment shall have discrete settings and each function is independent from all other adjustments.

a) Adjustable Long Time Ampere Rating and Delay
b) Adjustable Short Time Pickup and Delay (delay includes I^2t IN and I^2t OUT)
c) Adjustable, Defeatable Instantaneous Pickup (with OFF position)
d) High Level Selective Override

3) Each circuit breaker shall be capable of being removed from the front of the switchboard.

2.3 INSTRUMENTATION

A. With the main circuit breaker, provide a Square D PowerLogic PM5000 series meter with the following characteristics:

1. Current/Voltage Inputs

a. The meter shall have no less than 4 voltage inputs and 5 current inputs
b. The meter in its standard configuration shall be able to accept 600VAC without using potential transformers.
c. The meter shall be able to withstand 1500 VAC RMS continuously.
d. The meter shall support nominal current ratings of 1A, 2A, 5A, 10A, and/or 20A.

2. Provide at minimum the following voltage & current values:

a. Voltage L–L Per-Phase, L-L 3-Phase Avg, L–N Per-Phase, 3-Phase Avg, Voltage % unbalanced
b. Current values: Current Per-Phase, Current, Neutral (measured), Current 3-Phase Avg, Current % Unbalanced.
c. Power & energy values:
- Real Power (Per-Phase, 3-Phase Total)
- Reactive Power (Per-Phase, 3-Phase Total)
- Apparent Power (Per-Phase, 3-Phase Total)
- Power Factor – True (Per-Phase, 3-Phase Total)
- Power Factor – Displacement (Per-Phase, 3-Phase Total
- Accumulated Energy (Real kWh, Reactive kVARh, Apparent kVAh)
- Incremental Energy (Real kWh, Reactive kVARh, Apparent kVAh)
- Conditional Energy (Real kWh, Reactive kVARh, Apparent kVAh)
- Reactive Energy by Quadrant

2.4 SURGE SUPPRESSION DEVICE (SPD)

A. Provide SPD protection externally mounted to the switchboard specified in Section 26 43 13, Surge Suppression Devices.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.

B. Check that concrete pads are level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install switchboard in accordance with manufacturer's written guidelines, the NEC, and local codes.

3.3 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure, using a Megger, the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 VDC; minimum acceptable value for insulation resistance is 1 megohms. NOTE: Refer to manufacturer's literature for specific testing procedures.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

D. Physically test key interlock systems to check for proper functionality.

E. Test ground fault systems by operating push-to-test button.

3.4 IDENTIFICATION

A. Provide engraved switchboard nameplate permanently affixed to main lug or main breaker section cabinet giving switchboard name designation, system voltage, and name of switch board supply source.

B. Provide each branch or feeder device with LN engraved nameplate permanently affixed to the cabinet adjacent to the device giving the name of the load served.

1. Spare devices or devices for future loads shall be so identified.
2. Spaces prepared for future devices shall be so identified, along with the maximum ampere rating or frame size the prepared space can accept.

C. Provide identification in accordance with Section 26 05 53 - Identification for Electrical Systems.

D. Provide permanent identification for low voltage, control, metering, and instrumentation terminal blocks and individual terminals.

3.5 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturers specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust circuit breaker trip and time delay settings to values as instructed by the Engineer.

3.6 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

B. Throughout the construction period, maintain switchboard and interior free of duct, debris, wire trimmings, etc. Provide heavy duty plastic barriers as required.

C. Before final acceptance thoroughly clean switchboards and interiors and vacuum clean to a dust free condition.

3.7 TRAINING

A. Provide eight hours of training for the Owner's personnel in the operation and maintenance of the equipment.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide lighting and appliance branch circuit panelboards, circuit breakers and accessories.

B. Related work specified in other sections:

1. 26 00 00 - Electrical

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. NEMA PB 1 - Panelboards

B. NEMA PB1.1 - Instructions for Sate Installation, Operation and maintenance of Panelboards Rated 600 Volts or Less.

C. NEMA AB 1 - Molded Case Circuit Breakers

D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

E. UL 50 - Enclosures for Electrical Equipment

F. UL 67 - Panelboards

G. UL 98 - Enclosed and Dead-front Switches

H. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

I. Federal Specification W-P-115C - Type Class 1

J. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.

1.5 SUBMITTALS

A. Submit Shop Drawings including:

1. Voltage Ratings.
2. Main lug or breaker rating and location voltage ratings.
3. Main Bus Rating.

4. Neutral Bus Rating and location.
5. Ground Bus Rating and location.
6. Thru-feed or sub-feed lug ratings and location.
7. Overall Panelboard Dimensions.
8. Interior Mounting Dimensions.
9. 1/4" scale layout of proposed equipment location including required working clearances, interference with other equipment and available recessing depth where applicable.
10. Location and arrangement of branch breakers.
11. Number of poles, trip ratings, and interrupting ratings of branch breakers.
12. Top and bottom conduit entries and knockouts.
13. Enclosure NEMA Type.
14. Panel deadfront, trim, door, hinge and locking provisions.
15. Manufacturer's literature describing circuit breakers and trip units for each type and frame employed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

D. Conform to NEMA PB2 service conditions during and after installation of panelboards.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacturer of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company.
2. General Electric.
3. Eaton.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working prder for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. Interior:

1. Shall be equal to Square D type NF panelboard for 480 volt and Square D NQOB for 208 volt. Continuous main current ratings, as indicated on drawings.
2. Minimum Short Circuit Rating:

a. 65,000 rms symmetrical amperes at 480Y/277 or as indicated on the Drawings.
b. 25,000 rms symmetrical amperes at 208Y/120 or as indicated on the Drawings.
c. All panelboard components shall be fully rated for the required short circuit interrupting rating. Series rating of devices is not permitted.

3. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current rating shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated aluminum. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.
4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
5. A solidly bonded aluminum equipment ground bar shall be provided. An additional aluminum isolated/insulated ground bar shall also be provided as indicated on the Drawings.
6. UL Listed panelboards with 200% rated solid neutral shall be plated aluminum for non-linear load applications. Panelboards shall be marked for non-linear load applications.
7. Interior trim shall be dead-front construction to shield user from energized parts. Dead-front trim shall have filler plated covering unused mounting space.
8. Nameplate shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, CSA/UL Listed label ans short circuit current rating shall be displayed on the interior or in a booklet format.
9. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
10. Interior phase bus shall be pre-drilled to accommodate field installable options (i.e., Sub-Feed Lugs, Sub-Feed Breakers, and Thru-Feed Lugs).
11. Interiors shall accept 125 ampere breakers in group mounted branch construction.

B. Main Circuit Breaker

1. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 Deg.C. ambient environment. Thermal elements shall be ambient compensating above 40 Deg.C.
2. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located in the front of the breaker that allows the user to simultaneously select the desired trip level all poles.
3. Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breaker shall be CSA and UL Listed for reverse connection without restrictive line or load markings.
4. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.
5. Lugs shall be UL Listed to accept solid or standard copper and aluminum conductors. Lugs shall be suitable for 75 Deg.C. eated wire.
6. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

C. Branch Circuit Breakers

1. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an overcurrent toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles
4. The exposed faceplates of all branch circuit breakers shall be flush with one another.
5. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 Deg.C. rated wire.
6. Breakers shall UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.
7. Breaker shall be UL Listed with the follow ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), (15-20A) Switch Duty (SWD), (15-50A) Equipment Protection Device (EPD) (480Y/277Vac maximum).

D. Enclosures

1. Type 1 Boxes

a. Boxes shall be hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvannealed steel not acceptable.
b. Boxes shall have removable endwall with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
c. Box width shall not exceed 20" wide.

2. Type 1 Fronts

a. Front shall meet strength and rigidity requirements per UL 50 Standards. Shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
b. Mounting shall be flush or surface as indicated on the Drawings.
c. Front shall have flat latch type lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
d. Fronts shall be hinged door-in-door construction with front trim connected to enclosure with continues piano hinge and latch to access all wiring and termination without removing the door from the enclosure. A separate door, hinge and latch shall be provided to access the deadfront compartment to provide access to main and branch breaker operating handles with no exposure to energized parts.

3. Type 3R, 5 and 12

a. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
b. All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One 91) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
c. Maximum enclosure dimensions shall not exceed 21" wide and 9.5" deep.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with manufacturer’s written instructions, NEMA PB 1.1 and NEC standards.

B. Provide panelboard supports to the building structure independent of raceways.

3.2 FIELD QUALITY CONTROL

A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer’s written specifications.

3.3 IDENTIFICATION

A. Provide engraved panelboard nameplate permanently affixed to the panel boor, giving panelboard name designation, system voltage, and name of the panelboard supply source.

B. Provide a neatly typewritten circuit directory card in card holder inside panel door describing the name and location of devices served by each branch breaker using numbers finally established at the project.

3.4 FUTURE PROVISIONS

A. From each flush mounted panelboard section, provide a minimum of two 1" conduits stubbed into the accessible ceiling and/or crawl space, as may be available, for future branch circuit wiring.

B. Provide a pull cord in all future conduits with identifying tags on both ends.

3.5 COORDINATION OF LOADS SERVED

A. Confirm that all branch circuit breakers are of the proper type and configuration for the loads finally connected:

1. HCAR Rated.
2. HID Rated.
3. GFCI Rated.
4. AFCI Rated.
5. Three pole common trip breakers for multi-wire branch circuits.

B. Reconnect loads, rearrange branch circuit breakers of provide new breakers as required to insure branch circuit breakers are proper type and properly rated for the loads finally connected.

3.6 CLEANING

A. Throughout the construction period, maintain panelboards and interiors free of dust, debris, wire trimmings, etc. Provide heavy duty plastic barriers as required.

B. Before final acceptance, thoroughly clean panelboards and interiors and vacuum clean to a dust free condition.

3.7 TRAINING

A. Provide eight hours of training for the Owner’s personnel in the operation and maintenance of the equipment.

END OF SECTION

SECTION 26 27 16

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 REFERENCE DOCUMENTS

A. Conditions of the Contract and Division 01 - General Requirements are hereby made a part of this section.

B. All sections of this specification.

1.2 DESCRIPTION

A. Work Included: Provide cabinets for the installation of wiring and equipment.

B. Related work specified in other section:

1. Electrical: Section 26 00 00
2. Panelboards: Section 26 24 16
3. Enclosed Switches and Circuit Breakers: Section 26 28 16
4. Control Voltage Electrical Power Cables: Section 26 05 23

1.3 QUALITY ASSURANCE

A. Source Quality Control: Tests to meet applicable Underwriters' Laboratories, Inc. Standards.

B. Reference Standards:

1. Underwriters' Laboratories, Inc. applicable Standards.
2. National Electrical Code.

C. Design Criteria: National Electrical Manufacturer's Association construction types based on environment.

1. Indoor: NEMA Type 1
2. Outdoor: NEMA Type 3R

1.4 SUBMITTALS

A. Shop Drawings shall include dimensions, knockout sizes and locations, material types and gauges, finishes, and installation methods.

B. Certificates shall include labels of Underwriters' Laboratories, Inc., and National Electrical Manufacturer's Association affixed to each item.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D

B. General Electric

C. Eaton

2.2 MATERIALS

A. For Panelboards:

1. Same manufacturer as panelboard, boxes of code gauge steel, welded with edges turned to receive trim, and galvanized.
2. Trim and doors No. 12 gauge steel minimum, hinged door, flush tumbler lock and catch keyed alike throughout the work, factory enamel finish, suitable for field color coat.
    a. Flush: Overlap minimum 3/4 inches top, bottom, and sides.
    b. Surface: Same size as cabinet.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine structure to which cabinets are to be secured for defects which affect the execution and quality of work.

B. Do not start work until defects are corrected.

3.2 PREPARATION

A. Carefully measure and lay out exact locations.

B. Provide supports.

3.3 INSTALLATION

A. Provide cabinets where indicated and where necessary.

B. Provide flush type in finished areas centered in paneling and other Architectural features.

C. Provide surface type in equipment rooms, above accessible finished ceilings, and in crawl spaces.

D. Install lighting and power cabinets with tops 6 feet 6 inches above finished floor.

E. Install cabinet trim and doors straight and plumb.

3.4 CABINET IDENTIFICATION

A. Cabinets for all panelboards, switchboards, disconnect switches, transformers, motor starters, and electrical equipment furnished shall be provided with engraved phenolic lamacoid plastic name plates with 1/2 inch block engraving.

B. Name plates shall give equipment designation as scheduled on the drawings, circuit number designation, and voltage and phase of service.

3.5 ADJUSTMENT AND CLEANING

A. Adjust trims and doors for vertical and horizontal alignment.

B. Clean surfaces to be painted.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide wiring devices and cover plates for outlets designated to receive them.

B. Related work specified in other section:

1. 26 00 00 Electrical
2. 26 05 33 Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. U.L. 20 - General Use Snap Switches.

B. U.L. 498 - Attachment Plugs and Receptacles.

C. NEMA WD-1 General Color Requirements for Wiring Devices.

D. NEMA WD-6 Configurations for Specific Purpose Plugs and Receptacles.

E. Federal Specification WS-896 Switches, Toggle, Flush mounted.

F. Federal Specification WC-596 Connector, Electrical Power.

1.5 SUBMITTALS

A. Samples: Provide samples upon specific request for typical NEMA devices.

B. Product Data: If materials are by manufacturers other than those specified, submit manufacturer's product data describing materials and electrical ratings.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver devices and cover plates in manufacturer’s sealed unopened packages and protect from the introduction of dust and moisture.

B. Do not install wiring devices and cover plate until adjacent finishes are complete and the area has been cleaned to a dust free dry environment.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with at least ten years experience in the manufacture of similar equipment.

B. All wiring devices on the project shall be of the same manufacturer where rated 50 amperes or less.

C. Acceptable manufacturers:

1. Leviton.
2. Hubbell.
3. Pass & Seymour.
4. Cooper/ Arrow Hart

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless noted otherwise, wiring devices shall be standard industrial grade devices, gray color, with Type 302 stainless steel covers.

B. Where specifically noted on the drawings or required by the Architect, wiring devices in finished areas shall be Decora commercial grade devices, white color, with commercial grade thermoplastic matching cover plate.

C. Where required by the National Electrical code or local codes and ordinances, receptacles shall be commercial grade GFCI type, matching color with other wiring devices in the area, with matching polycarbonate cover plate.

2.2 INDUSTRIAL GRADE DEVICES

A. Shall be equal to the devices listed below.

B. Switches

1. Single pole wall toggle, Leviton 1221-2. P&S PS20AC1.
2. Three way wall toggle, Leviton 1223-2. P&S PS20AC3.
3. Four way wall toggle, Leviton 1224-2. P&S PS20AC4.
4. Single pole key toggle, Leviton 1221-2KL. P&S PS20AC1KL.
5. Three way key toggle, Leviton 1223-2KL .P&S PS20AC3KL.
6. Four way key toggle, Leviton 1224-2KL. P&S PS20AC4KL.

C. Straight Blade Receptacles

1. 125V, 20A, 5-20R, Simplex, Leviton 5361, P&S 5361.
2. 125V, 20A, 5-20R, Duplex, Leviton 5362, P&S 5362.

D. Locking Type Receptacles

1. 125V, 20A, L5-20R, Simplex, Leviton 2310. P&S L520R.
2. 250V, 20A, L6-20R, Simplex, Leviton 2320. P&S L620R.

E. Isolated Ground Receptacles

1. 125V, 20A, 5-20R, Duplex, Industrial grade, Leviton 5362-IG. P&S 1G5362.

F. GFCI Receptacles

1. 125V, 20A, 5-20R, Duplex, Commercial Grade, Leviton 7599. P&S 1595.

2.3 WEATHER RESISTANT DEVICES

A. Where noted on the drawings or located exterior to the building, wall switches shall be provided with die cast zinc weatherproof, gasketed cover plate with NEMA 3R classification in wet locations.

B. Where noted on the drawings or located exterior to the building, wall receptacles shall be provided with die cast zinc weatherproof gasketed cover plates with NEMA 3R classification, listed for in use unattended plugs in wet locations.

2.4 MOTOR RATED SWITCHES

A. Fractional horsepower motors with internal overload protection shall be provided with double pole or three pole manual motor starting switches equal to Leviton MS series.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Align wiring device covers vertically and horizontally and assure flush fit to wall surface.

B. Surface mounted devices in cast ferrous boxes shall be furnished with stamped steel galvanized face plates.

3.2 IDENTIFICATION

A. Each receptacle shall be provided with a permanently affixed name plate giving the panelboard and branch circuit number supplying the outlet.

B. Identification shall be on the inside or outside of the cover plate as directed by the Architect.

C. Manual Motor Rated Switches shall be provided with permanently attached engraved phenolic name plates giving the panel and branch circuit source of supply and the name of the device controlled.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for Coordination of work with other portions of the work.

1.2 DESCRIPTION

A. Work Included: Provide low voltage fuses for overcurrent protection in fusible devices.

B. Related Work specified in other sections:

1. Electrical: Section 26 00 00
2. Panelboards: Section 26 24 16
3. Enclosed Switches and Circuit Breakers: Section 26 28 16

1.3 QUALITY ASSURANCE

A. The equipment provided shall meet the requirements of the National Electrical Code and local codes and ordinances.

B. The equipment provided shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCE STANDARDS

A. NEMA FU1 Low Voltage Cartridge Fuses

B. UL 248 Low Voltage Fuses

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's bulletins, and minimum melting and total clearing time charts for each type of fuse.

1.6 JOB CONDITIONS

A. Deliver fuses to the project in the manufacturers new unopened shipping containers.

B. Store fuses in a clean, dust free, cool environment until required for installation to energize equipment.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturers

1. Bussman

2. Littlefuse
3. Ferraz - Shawmut

1.8 WARRANTY

A. Fuses shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 FUSES - 600A AND BELOW

A. All fuses shall have a separate overload and short-circuit elements. Fuses shall incorporate a spring activated thermal overload element that has a 284 degrees Fahrenheit melting point alloy.

B. The fuses shall have time-delay capabilities in accordance with UL standards for Class RK1, J, or CC fuses and an interrupting rating of 300,000 amperes RMS symmetrical, listed by a nationally recognized testing laboratory.

C. Peak let-through currents and I^2t let-through energies shall not exceed the values established by UL for Class RK1 or J fuses.

2.2 MOTOR CIRCUITS

A. The fuses shall be applied for all motors protected by properly sized overload relays:

1. Class RK1 fuses shall be installed in ratings of 130%, or 150% for Class J fuses, of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized at 175% of the motor full-load current, or the next standard size larger if 175% does not correspond to a standard fuse size.
2. Class L fuses shall be installed in ratings of 175% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 300% (or next size smaller).
3. Class CC fuses shall be installed in ratings of 200% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 400% (or next size smaller).
4. Fuses shall be tested and have documentation verifying compliance of Type 2 protection requirements for motor starters per UL508E or IEC 60947-4 for motor controllers.

2.3 SUPPLEMENTARY - LIGHT FIXTURE PROTECTIVE FUSES

A. Fluorescent fixtures shall be protected by “BUSSMANN® GLR or GMF Fuses in HLR Holders. These fixtures shall have individual protection on the line side of the ballast. A fuse and holder shall be mounted within, or as part of, the fixture. Size and type of fuse to be recommended by this fixture manufacturer.

B. All other ballast-controlled light fixtures shall be protected by BUSSMANN® KTK or FNQ Fuses in HEB, HEX, HEY, HPF, or HPS Holders. These fixtures shall have individual protection on the line side of the ballast. Fuse and holder shall be mounted in a location convenient for changing fuses. Holder shall be mounted in protected location or be an in-line waterproof holder (HEB, HEX, or HEY). Size and type of fuse to be recommended by the fixture manufacturer or as indicated on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment for the manufacturer to the job site, or from water that may contact the fuse before the equipment is installed.

B. Final tests and inspections shall be made prior to energizing the equipment. This shall include a thorough cleansing, tightening, and review of all electrical connections and inspection of all grounding conductors.

3.2 SPARES

A. In addition to fuses consumed during testing, furnish 10%, but not less than three of each, of each size and type fuse used for the project, and store in spare fuse cabinet.

B. Provide Bussmann SFC spare fuse cabinet in main electrical room.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide disconnect switches and enclosed circuit breakers for branch circuit, motor circuits, and items of equipment.

B. Related work specified in other sections:

1. Division 23
2. 26 00 00 Electrical
3. 26 28 13 Fuses

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. UL 50 Cabinets and Boxes

B. UL 98 Enclosed and Deadfront Switches

C. UL 489 Molded Case Circuit Breakers

D. UL 977 Fused Power Circuit Devices

E. NEMA AB1 Molded Case Circuit Breakers and Molded Case Switches

F. NEMA KS1 Enclosed Switches

1.5 SUBMITTALS

A. Submit shop drawings including:

1. Enclosure outline drawings and dimensions.
2. Nameplate schedule.
3. Assembly ratings including:

a. Main lug ratings and location.
b. Voltage ratings.
c. Short circuit ratings.

4. Conduit entry and exit locations, dimensions, and knock-outs.
5. Cable terminal sizes.
6. Fuse types and ratings.
7. Manufacturer's literature describing circuit breakers and trip units.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage insured in shipping.

C. Store and protect equipment from moisture and dust by storing in a clean, dry, heated space. Provide additional heavy plastic cover to protect the equipment and components. Provide auxiliary heating in the sections in accordance with the manufacturer's recommendations.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company.
2. General Electric.
3. Eaton.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Enclosed Switches

1. Provide enclosed switches where indicated on the drawings or required by NEC.
2. Switches shall be NEMA Type HD, heavy duty, rated 600 volts, with quick-make, quick break switch units and external operator, rated 100,000 A.I.C.
3. Switches shall be fused or unfused as shown on the drawings and as required by NEC, capacity and number of poles as indicate don the drawings.
4. Enclosures shall be provided with interlocks to prevent opening the enclosure without first opening the switch and to prevent operating the switch with the enclosure open.
5. Enclosures shall be provided with a means for pad locking in the open position.
6. Enclosures shall be provided with an equipment grounding lug.
7. Enclosures for use on four wire shall be provided with an insulated neutral bus.
8. Line side and load side terminals shall be provided with insulating cover to prevent accidental contact.
9. Indoor locations shall be provided with NEMA Type 1 Enclosures.
10. Outdoor locations shall be provided with NEMA Type 3R Enclosures and water tight threaded hubs for conduit entry.

B. Enclosed Circuit Breakers

1. Provide enclosed circuit breakers or molded case switches where indicated on the drawings or required by the NEC.

2. Circuit breaker for rating 250 amperes or less shall be thermal magnetic molded case circuit breakers.
3. Circuit breakers 300 amperes through 1200 amperes shall be electronic trip, microprocessor based, true RMS sensing, with adjustable, defeatable instantaneous pickup.
4. Molded case switches shall be non-automatic with no over current trip function.
5. Units shall be 600 volt or 250 volt as required and unless noted otherwise shall be 42,000 A.I.C.
6. Enclosures shall be provided with a means for pad locking in the open position.
7. Enclosures shall be provided with and equipment ground bus.
8. Enclosures for use on four wire systems shall be provided with an insulated neutral bus.
9. Line side and load side terminals shall be provided with insulating covers to prevent accidental contact.
10. Indoor locations shall be NEMA Type 1 Enclosures.
11. Outdoor locations shall be NEMA Type 3R enclosures and watertight hubs for threaded conduit entry.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect building structure to which disconnects are to be secured for defects which affect the execution and quality of work.

B. Do not start work until defects are corrected.

3.2 PREPARATION

A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

3.3 INSTALLATION

A. Provide disconnects where indicated and where required by the National Electrical Code and all equipment where integral disconnects are not provided by the manufacturers.

B. Provide disconnects mounted to building structure ahead of flexible conduit final connection to each fan powered terminal box.

C. Install within sight of equipment served.

D. Provide final connection to equipment served.

E. Provide engraved lamicoid name plate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.

END OF SECTION

SECTION 26 43 13

SURGE SUPPRESSION DEVICES

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Provide low voltage surge suppression devices where shown on the drawings.

B. Related work specified in other sections

1. 26 00 00 Electrical
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 05 32 Raceways
4. 26 24 13 Circuit Breaker Distribution Switchboards
5. 26 24 16 Panelboards

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

A. UL 1449 - 3rd Edition - Surge Protective Devices

B. UL 1283 - Electromagnetic Interference Filters

C. ANSI C62.41 - Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits

D. ANSI C62.45 - Guide for Surge Testing for Equipment Connected to Low Voltage AC Power Circuits

E. IEEE 1100 - Emerald Book

F. NFPA 70 - National Electric Code

G. NEMA LS1 - Low Voltage Surge-Protection Devices

1.5 SUBMITTALS

A. Submit Shop Drawings Including:

1. Dimensions and weight of enclosure.
2. Conduit entry locations and knockouts.
3. Wiring diagram showing field connections.
4. Manufacturer’s recommended wire and breaker sizes.
5. Internal wiring diagram illustrating all modes of protection.

6. Internal functional block diagram.

B. Documentation for UL 1449 Listing verifying

1. Short Circuit Current rating (SSCR)
2. Voltage Protection Ratings (VPR)
3. Maximum Continuous Operating Voltage (MCOV)
4. I-Nominal Rating (I-n)
5. Type 1 Device Listing

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

D. Conform to NEMA PB2 service conditions during and after installation of panelboards.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years experience in the manufacture of similar equipment.

B. Acceptable Manufacturers:

1. Square D Company.
2. Eaton.
3. Current Technology.
4. Advanced Protection Technologies.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 RATINGS

A. The Short Circuit Current Ratings (SCCR) shall be 200 KAIC without requiring an upstream protective device.

B. The Voltage Protection ratings (VPR) shall not exceed the following values:

C. For 120/208 volt systems, 700 volts L-N, L-G, N-G and 1200 volts L-L.

D. For 277/480 volt systems, 1200 volts L-N, L-G, N-G and 1800 volts L-L.

E. The Maximum Continuous Voltage Rating (MCOV) shall be not less than 115% of the nominal system operating voltage.

F. The I-Nominal rating shall be not less than 20 KA.

G. The units shall have not more than 10% deterioration or degradation of the VPR due to repeated surges.

H. The attenuation of the EMI/RF1 filter shall be a minimum of -50dB at 100KHz in accordance with UL1283.

2.2 OVERCURRENT PROTECTION

A. The unit shall contain thermally protected MOV's. The thermal protection element shall disconnect the MOV's from the system in a fail safe manner.

2.3 SERVICE DISCONNECT

A. Where SPD's are connected directly to a panelboard or switchboard bus without a feeder breaker or switch, the SPD shall be provided with an integral service disconnect.

2.4 SPD TYPE

A. All SPD's connected on the line side of the service disconnecting means shall be Type 1.

B. All SPD's connected on the load side of the service disconnecting means shall be Type 1 or Type 2.

2.5 ACCESSORIES

A. Surge counter with battery backup and manual reset button shall be provided.

B. Visible indication of proper operation shall be provided.

C. An audible alarm and dry contact alarm shall be provided to signal when any module has reached end of life condition.

2.6 ENCLOSURES

A. SPD's installed interior to the building shall be provided with NEMA 1 Enclosures.

B. SPD's installed exterior to the building or subject to the elements shall be provided with NEMA-4 Enclosures.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully measure and lay out exact locations of TVSS in conference with the Engineer.

B. Assure that TVSS may be installed without adversely affecting the integrity and appearance of the building structure and with the clearances required by the National Electrical Code.

3.2 INSTALLATION

A. Provide supports to the building structure, independent of raceways.

B. Install tops of cabinet at 6 feet, 6 inches, above finished floor where possible.

C. Install ground connection as indicated in Grounding specifications.

D. Provide 3 pole 60 amp breaker to serve unit when required for branch circuit panelboard applications.

E. Provide Identification:

1. Engraved, lamacoid plastic name plate, giving panelboard designation being protected.

F. Lead length from terminal of circuit breakers shall not exceed 12".

END OF SECTION

SECTION 26 51 01

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

A. Comply with Division 1 - General Requirements and related documents.

B. Comply with all other Division 26 sections as applicable.

C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

A. Work Included: Provide LED lighting fixtures and accessories for interior illumination of the building.

B. Related work specified in other Sections:

1. 26 00 01 General Provisions
2. 26 05 19 Low Voltage Electrical Power Conductors and Cables
3. 26 05 29 Hangars and Supports for Electrical Systems
4. 26 05 32 Raceways
5. 26 05 33 Boxes for Electrical Systems
6. 26 09 26 Occupancy Sensor Lighting Controls

1.3 QUALITY ASSURANCE

A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.

B. All equipment supplied shall be Underwriter’s Laboratories Inc. listed and so labeled.

C. Laboratory Testing: Photometric testing shall be by Independent Testing Laboratories, Inc., based on Illuminating Engineering Society published procedures, and shall include candlepower distribution tabulation and zonal cavity coefficient of utilization tabulation.

1.4 REFERENCE STANDARDS

A. Underwriters' Laboratories No. 57 - Fixtures, Electric Lighting.

B. Underwriters’ Laboratories No. 924 - Emergency Lighting and Power Equipment.

C. Underwriters’ Laboratories No. 1598 - Luminaires

D. Underwriters’ Laboratories No. 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

1.5 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, dimensions, coefficients of utilization, and lamp types for each fixture which is the product of one of the listed acceptable manufacturers.

B. Submit large scale shop drawings and copies of independent testing laboratory test report, along with manufacturer's literature for each fixture which is the product of any manufacturer not listed as acceptable.

C. Submit samples of fixtures upon specific request.

D. Certificates: Labels of Underwriters' Laboratories, Inc.; affixed to each item of material.

1.6 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.

B. Upon arrival, inspect equipment for damage incurred in shipping.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 MANUFACTURER

A. The equipment shall be the product of a manufacturer with a minimum of ten years' experience with the manufacturer of similar equipment.

B. Listed in schedule and with materials.

1.8 WARRANTY

A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lighting Fixtures:

1. Fixtures shall be of the lighting fixture types scheduled on the drawings according to the letter type designations on the plans.
2. If letter type designation is omitted from any fixture shown on the plans, provide the same fixture type as employed in rooms of similar usage.
3. Where manufacturer's model numbers are used to describe fixtures, the intent is to establish the kind and quality of the fixture. The Contractor is responsible for examining the drawings to establish correct ordering information for each fixture including but not limited to voltage for the branch circuit supply, ceiling trim and mounting means for the ceiling material.

B. Exit Signs:

1. Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

C. LED Source Package Lamps:

1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
2. LED source packages, arrays or modules and power supplies shall be tested in accordance with LM-79/LM80.
3. LED light source packages, arrays or modules shall be tested in accordance with LM-80 depreciation test and L70 rated life result shall be a minimum of 50,000 hours.
4. LED lamp color temperature of 4000K with minimum 80% CRI is required for LED lamps. Lamp lumen minimum values as scheduled.
5. Luminaire power factor shall be minimum 90%.
6. LED fixtures, source packages, arrays or modules and power supplies shall be Design Lights Consortium (DLC) qualified.

D. LED Power Supplies/Drivers:

1. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
2. Shall operate from 60 Hz input source and have input power factor >90% and a minimum efficiency of 70% at full rate load of the driver.
3. Shall have short circuit and overload protection.
4. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°F.
5. Power supply output shall be regulated to ±5% across published load range.
6. Shall have as Class A sound rating.
7. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
8. Shall contain no PCBs.
9. Shall carry a five (5) year minimum warranty from date of manufacturer against defects in materials or workmanship, including a replacement for operation at or below the maximum case temperature specification. For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30%.
10. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

E. Emergency Lighting Units with Battery Packs:

1. Self-contained units complying with UL 924.

a. Battery: Sealed, maintenance-free, lead-acid type.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

F. LED Source Package Lamps:

1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
2. LED source packages, arrays or modules

G. Lighting Fixture Support Components:

1. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
2. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
3. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
4. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
5. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
6. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
7. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

H. Accessories: Manufacturers' standard mounting ring, trim flanges, hanger bars, spacers, supports, plaster frames of non-ferrous material or cadmium plated steel. Do not use painted steel plaster frames.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect Architectural drawings and specifications, including ceiling alternates, to determine ceiling material to be installed.
B. Inspect Architectural reflected ceiling plans.
C. Inspect installed ceiling components and pole bases for defects affecting the quality and execution of work.

3.2 PREPARATION

A. Verify ceiling material, type, support method and alignment.
B. Layout exact locations of fixtures in accordance with reflected ceiling plans, fixtures' and switches' outlet boxes and supports, and poles and standard bases.
C. Provide specified outlet boxes and conduit system for the light fixtures including conduit support system.
D. All lighting fixtures shall be supported from building structure. Do not support lighting fixtures from the ceiling system. Fixtures shall be supported by supplementary hangars located within 6 inches of each corner, or supported independently from the structure. Do not support lighting fixtures from other building systems located above the ceiling such as fire sprinkler piping, HVAC piping, plumbing piping, equipment or ductwork.

3.3 INSTALLATION

A. Provide lighting fixtures, control systems and wiring.

B. If designation omitted on drawings, provide same type fixtures employed in rooms of similar usage.

C. Provide spacers for fixtures mounted on low density ceiling material.

D. Provide plaster frames for recessed fixtures in plaster or gypboard ceilings.

E. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.

F. Install fixtures in gypsum board ceilings to recess in the space available between structural members where the ceiling is installed tight against the structure.

G. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.

3.4 ADJUSTMENT AND CLEANING

A. Adjustment: Adjust lamp positions for desired effects. Align fixtures with building walls and tile joints.

B. Cleaning: Remove dirt, grease, and foreign materials from fixtures. Remove fingerprints, smudges, and dirt from fixture's lenses and lamps.

3.5 LIGHTING FIXTURE SCHEDULE

A. Reference drawings for Lighting Fixture Schedule.

END OF SECTION

SECTION 28 31 10

FIRE DETECTION AND ALARM - EXPANSION OF EXISTING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF THE WORK

A. The contractor shall utilize all existing current campus room identification for programming of fire alarm zones. Rooms shall be labeled with room names, numbers or both as directed by the owner.

B. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.

C. Provide for the design and installation of the fire alarm system in renovation and areas, with suggested minimum device coverage as indicated. Additional devices may be required for NFPA approved coverage based on existing conditions not known at the time of issue.

D. Provide for the expansion of the existing Fire Alarm system as required for the renovation spaces as shown on the plans. The existing Fire Alarm shall be expanded to include the required zone coverage for the added building zones included within this project. Include additional expansion modules, power supplies, cable and all other materials as required. The existing campus to be expanded is;

1. Bryson Elementary School – Gym Addition & Renovation.

E. The existing fire alarm system is new, and under the originally installation warranty period. All work shall be performed by the original installing contractor. No substitutions.

1. Existing fire alarm installing contractor:

a. PAC Systems/CINTAS
751 109th St.
Arlington, TX 76011
817-640-2223

F. Provide Surge Protection Devices (SPDs) / TVSS surge suppression as required by NFPA 72 for all underground circuits.

G. Required system features:

1. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall be supervised either electrically or by software-directed polling of field devices. The system shall also be listed by Underwriter's Laboratories under the category of Control Unit System (UOJZ) and Control Unit Accessories (UOXX).
2. Multiplex communication conductors.
3. Control of auxiliary devices, such as fan shut down, etc.
4. Battery standby system – 24 hour.
5. Remote station annunciator contacts.
6. Microprocessor based monitoring and control system.
7. Multiplex communication conductors. (Class A)
8. Remote station annunciator, refer to drawings for location(s)
9. The system shall be 100% field programmable without the need for external computers or PROM programmers, and shall not require the replacement of memory IC's.

H. Fire alarm system shall be expandable by the addition of the required modules to the basic system.

I. Each zone shall consist of not more than eight manual or automatic devices.

J. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

K. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

L. Contractor to design and provide all equipment, accessories, and materials in accordance with the contract documents to provide a complete and operating system.

M. Conduits, boxes and other raceways required for the Fire Alarm system should be provided by the Fire Alarm Contractor, as required for a compliant design, including any revisions following the approved drawings by the Fire Alarm Contractor.

N. Building is to be designed to the code minimum but also to include the additional devices / requirements stipulated within this specification. If additional devices indicated require additional design requirements to be code compliant, that is to be taken into account during bidding and designing in order to design and build a fully compliant system.

O. **Review and possible changes to design are subject to review by the local Fire Marshal (or authority having jurisdiction), up to Final Testing and Acceptance by AHJ.**

P. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, analog addressable intelligent fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies and wiring as shown on the drawings and specified herein. The extent of fire alarm system work is shown on drawings and in schedules, and is hereby defined to include furnishing and installing of a system with the following sequence of operation:

1. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes fire alarm signaling devices, sounding a non-coded alarm, providing zone identification at the fire alarm control panel and annunciator panels.

Q. Design Criteria – In addition to designing/providing the code required minimums, the following shall be incorporated into the design utilizing the requirements of the code regarding spacing, location, additional required coverage area, within the renovation areas only:

1. Strobes – each room is to provide a minimum of 1 visual strobe. The location of audio notification Horn and Visual combo strobes to be determined by designer based on Db level requirement of the code.
2. Heat Detectors - in addition to spaces required by code, provide at the following rooms: Electrical, mechanical.
3. Provide 212deg F heads for the elevator machine room.

R. **Fire Alarm contractor shall provide all duct smoke detectors as shown on mechanical plans, coordinate with mechanical contractor for installation on all units scheduled to be rated at over 2000cfm**.

1. Fire Alarm Contractor shall subcontract with a mechanical contractor for all required work related to air handler fan shut-down.
2. Fire Alarm Contractor shall provide all duct detector devices, enclosures; the Fire Alarm Contractor's mechanical sub-contractor shall install the duct detectors on the existing systems, and provide fan shut down.

S. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

1.2 PERFORMANCE

A. Alarm and trouble signals shall be digitally encoded by listed electronic devices onto an NFPA Style 6 looped multiplex communication system.

B. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 6 Signaling Line Circuits.

C. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).

D. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y).

E. Power for initiating devices and notification appliances must be from the main fire alarm control panel to which they are connected.

F. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

G. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

H. Horn circuits and control equipment shall be arranged such that loss of any one (1) horn circuit will not cause the loss of any other horn circuit in the system.

1.3 SYSTEM OPERATION

A. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

1. The System Alarm LED shall flash.
2. A local piezo-electric signal in the control panel shall sound.
3. The 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
5. The audio portion of the system shall sound the proper signal to the appropriate zones.

1.4 QUALITY ASSURANCE

A. The National Fire Protection Association publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Use current locally adopted editions of the standards.

1. No. 72A Local Protective Signaling Systems.
2. No. 72D Proprietary Protective Signaling Systems.
3. No. 72E Automatic Fire Detectors.
4. No. 90A Installation of air conditioning and ventilating systems.
5. No. 101 Life Safety Code.

B. The contractor furnishing and installing the equipment shall show satisfactory evidence with the shop drawings that they maintain stocks of replacement parts, and maintain a service department which is fully capable of maintaining the equipment.

C. Fire alarm systems shall be installed by an agent having a current certificate of registration with the State Fire Marshal's Office of the Texas State Board of Insurance, in accordance with state law. A "Fire Alarm Installation Certificate" shall be provided as required by the Office of the State Fire Marshall.

D. Warranty:

1. The Contractor shall warrant his work against defective materials and workmanship for a period of one year from the date of acceptance of the entire project, unless specific longer term is specified with Individual System Specification.
2. Neither Final Payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.
3. Contractor shall remedy any defects due thereto, and pay for any damage to other work resulting therefrom, which shall appear within a period of five years from the date of acceptance of the entire project (substantial completion).
4. The Owner shall give notice of observed defects with reasonable promptness.
5. This Guarantee shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

E. Project Record Documents:

1. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and uncovered existing utility piping outside the Building.
2. Upon submitting request for Final Payment, Contractor shall turn over to the Architect-Engineer, for subsequent transmittal to the Owner, clean, neatly marked set of reproducible plans showing “as installed” work.
3. In addition to the above, the Contractor shall accumulate during the Job’s progress the following data, in multiple duplication (three each), prepared in 3-ring binders of sufficient size, black in color, neat in appearance and turned over to the Architect-Engineer for checking and subsequent delivery to the Owner:

    a. All warranties, guarantees and manufacturer’s direction on equipment and material covered by the Contract
    b. Approved fixture/equipment brochures
    c. Copies of approved Shop Drawings
    d. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
    e. Any and all data and/or plans required during construction.
    f. Repair parts lists of all major items and equipment including name, address and telephone number of the local supplier or agent.
    g. The first page or pages shall have the name, addresses and telephone numbers of the following; General Contractor and all sub-contractors, Major Equipment Suppliers.

F. Training:

1. Upon completion of the work and at a time designated by the Owner’s representative, provide a formal training session for the Owner’s operating personnel to include location, operation and maintenance of all the mechanical, electrical and plumbing equipment and systems.
2. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Owner’s representative one week prior to training session.
3. At the conclusion of the instruction, obtain signatures of the attendees on each copy of the outline to signify that they have proper understanding of the operation and maintenance of the systems. Submit the signed outlines to the Owner’s representative and Engineer as a condition of final acceptance.

G. Plans and Specifications:

1. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures and equipment and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system.

2. The Systems shall include, but are not limited to, the items shown on the plans.
3. Exact locations of these items shall be determined by reference to the general plans and measurements of the Building and in cooperation with other Contractors, and in all instances, shall be subject to the approval of the Architect-Engineer.
4. The Architect-Engineer reserves the right to make any reasonable change in the location of any part this work without additional cost to the Owner.

H. Utilities, Locations and Elevations:

1. Locations and elevations of the various utilities within this scope of work have been obtained from the City, Owner and/or other substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without any guarantees as to the accuracy.
2. **The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations and the availability / characteristics (voltage/phase/pressure/capacity) of all utilities and services required, and shall adequately inform himself as to their relation to the work; the submission of bids or proposals shall be deemed evidence thereof.**
3. The Contractor shall coordinate all services with the respective Utility Company or Agency during construction; coordinate changes made by Utility Companies or Agencies to the design of the project, and coordinate with the Owner, Architect-Engineer, and Utility the scheduling of any shutdowns or delays that may occur in providing service.
4. The Contractor shall verify location / depth / direction of flow, conduct all necessary tests, inspections, coordinate with Owner's representatives and Utilities, and check for existing underground utilities before ditching / trenching / drilling.
5. The Contractor shall be responsible for repair of any cut of damaged lines or utilities he uncovers and disrupts. There are lines and utilities that may not be shown on the plans.

1.5 SUBMITTALS

A. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout and main control panel module layout, configurations and terminations.

B. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

C. Software Modifications

1. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

D. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of

contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. The main fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.2 MAIN FIRE ALARM CONTROL PANEL AND FIRE COMMAND CENTER:

A. Existing to be Reused.

B. Speakers: Provide manufacturer's standard construction fire alarm speaker, System Sensor Spectr- Alert Advance. UL listed to Standard 1971 and shall meet the following criteria:

1. Ceiling Mount:
    a. Indoor - System Sensor SPCW(V) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required for coverage.
2. Wall Mount Mount:
    a. Indoor - System Sensor SPW(V) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required.
    b. Outdoor- System Sensor SPW(K) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required for coverage.

C. Speaker Strobes: Provide manufacturer's standard construction fire alarm speaker / strobe, System Sensor Spectr- Alert Advance. UL listed to Standard 1971. . Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

1. Ceiling Mount:
    a. Indoor - System Sensor Advance Speaker Strobe SPCR Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.
2. Wall Mount Mount:
    a. Indoor - System Sensor SPSR Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.

b. Outdoor - System Sensor SPSRK Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.

D. Visual Devices: Provide manufacturer's standard construction fire alarm strobe, Silent Knight 5865 Series with flashing xenon light visual signal. UL listed to Standard 1971. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

E. Addressable Devices – General

1. Addressable devices shall provide an address-setting means using rotary decimal switches.
2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
3. Detectors shall be analog and addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
8. The following bases and auxiliary functions shall be available:

   a. Sounder base rated at 85 DBA minimum.
   b. Form-C Relay base rated 30VDC, 2.0A.
   c. Isolator base.

9. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).

F. Addressable Pull Box (Pullstation): Provide manufacturer's standard construction, red enclosure, manual fire alarm stations, double action semi flush mounting, Silent Knight SD500-PS, Addressable.

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75" or larger. Provide "Stopper II" with local audible alarm at each pullstation location. Provide "Weather Stopper II" with local audible alarm at exterior locations. (Verify with Each Authority Having Jurisdiction on acceptance of audible alarm on pull station covers.) Where allowed by Local Authority. Provide without audible alarm where audible alarm is not allowed.

G. Intelligent Photoelectric Smoke Detector: Provide manufacturer's standard construction automatic photoelectric type smoke detector, Silent Knight SD505-APS.

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

H. Intelligent Thermal Detectors (Heat Detector)

1. Thermal detectors shall be intelligent addressable devices rated at 135°F and have a rate-of-rise element rated at 15° F per minute. It shall connect via 2 wires to the fire alarm control panel signaling line circuit, Silent Knight SD505-AHS.

I. Door Holders and Closers:

1. Door holders, flush mounted standard hardware depth. Silent Knight FM998-120 or equal. Refer to electrical drawings for additional information and mounting locations.

J. Intelligent Duct Smoke Detector: (Duct Detector) Provide manufacturer's standard construction automatic smoke detectors, duct type, with sampling tubes, Silent Knight SD505-ADHR/DTS or equal, with auxiliary contacts for fan shut down as required. (Provided and installed by Fire Alarm Contractor, Addressable Device.)

1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

K. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops. Silent Knight SD500-AIM or SD500-MIM.
2. The monitor module shall mount in a 4" square, 2" deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2" x 1-3" x 2". This version need not include Style D or an LED.

L. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. Silent Knight Sd500-ANM.
2. The control module shall mount in a standard 4" square, 2" deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (FormC) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

M. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building. Silent Knight SD500-LIM.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4" deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

N. Cable

1. <u>All cable shall be color red.</u>

2.3 BATTERIES AND EXTERNAL CHARGER:

A. Battery:

1. Shall be 12 volt, Gell-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free.
4. Final battery size to be calculated & confirmed by system installer based on actual system loads.
5. External, physical dimension shall allow for placement within system enclosure.

B. External Battery Charger:

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 60 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.
5. Final battery charger characteristics to be calculated & confirmed by system installer based on actual system loads.

C. Microprocessor based monitoring and control system.

1. The monitoring and control system shall consist of a central processing unit, (CPU), Display Interface Assembly DIA, Remote Annunciator Panels. The system shall be of modular construction, with components connected together using multiplex wiring techniques to provide Fire Detection and Evacuation signals. System shall be Silent Knight IFP-1000 ESC Intelligent, Addressable, and Analog Multiplex Life Alarm or approved equal. CPU shall be surface or flush wall mounted control units where shown. Unit shall have all necessary components to completely supervise and operate the system. Power wiring shall be for single phase operation. Unit shall include the following functional equivalents, as required:

   a. Zone modules.
   b. Power supplies.
   c. Emergency battery for 60 hour backup.
   d. Battery charging circuit.
   e. Auxiliary relays.
   f. Common module.
   g. Controls: System reset, acknowledge, lamp test, trouble, silence.
   h. Indicators: Common alarm, common trouble, AC power failure, low battery, and power on.
   i. Other equipment and components as required for system operation.

2. System shall provide LCD annunciation to indicate system monitor point status, and toggle switches to allow operation of the system control points. Unit shall function as a zone annunciator and control center to initiate alarm or building evacuation function. Control center and Remote Annunciator shall be wall mounted, located as shown, with battery backup, self-contained power supply supplied by 120 volt emergency power if available or by dedicated 120 volt normal power circuit.

D. Provide fire alarm system products in sizes and capacities indicated, complying with manufacturer's published product information on standard materials and components designed and constructed for applications indicated.

E. Provide required basic wiring materials as specified in Division 26 sections. Comply with manufacturer's instructions and recommendations.

F. Tamper switches and water flow alarms, when furnished with sprinkler system, shall be connected to Fire Alarm System.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install system and materials in accordance with manufacturer's instructions and roughing in drawings, and details on the drawings. Install electrical work and use electrical products complying with requirements of applicable Division 16 sections of these specifications.

B. The term "wiring" is defined to include the providing of wire, conduit and miscellaneous materials as required for mounting and connecting the electrical devices. All wiring and devices shall be fully concealed unless otherwise approved by Engineer.

C. Install a complete wiring system as required by the local authority for fire alarm system. Conductor shall be two twisted pair fire alarm cable in a separate conduit system. Provide multi- conductor instrument harness bundle in place of single conductors where a number of conductors can be run along a common path. Fasten flexible conductors bridging cabinets and doors neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.

D. Install a flashing light and horn where required by the Local Authority Having Jurisdiction.

E. Manual stations are to be set 48" above finished floor. Alarm devices are to be set at 80" aff maximum. Alarm devices in Activity rooms, Gymnasiums and other similar use areas shall be suitably protected with substantial wire guards, not less than 11 gauge, and 1" x 2" mesh.

F. Number code or color code conductors, appropriately and permanently for identification and servicing of system.

G. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

H. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

I. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 TYPICAL OPERATION:

A. Actuation of any manual station, smoke detector, heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:

1. Activate all programmed horn circuits.
2. Actuate strobe units until the panel is reset.
3. Light the associated indicators corresponding to active horn circuits.

4. Release all magnetic door holders, Stage Draft doors and Fire doors to adjacent zones on the floor from which the alarm was initiated.
5. Return all elevators to the primary or alternate floor of egress.
6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1 requirements and be coordinated with the electrical contractor.
8. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as appropriate.
9. Activation of any sprinkler system low pressure switch, on valve tamper switch, shall cause a system supervisory alarm indication.

3.3 TEST:

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground initiating device circuits and verify response of trouble signals.
8. Ground signaling line circuits and verify response of trouble signals.
9. Ground notification appliance circuits and verify response of trouble signals.
10. Check installation, supervision, and operation of all intelligent smoke detectors using walk test.
11. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

B. The entire fire alarm system shall be tested in accordance with NFPA standards and other applicable standards. Results of such testing shall be recorded on forms approved for the purpose, certified and submitted to the Owner's representative with final documents.

3.4 FINAL INSPECTION:

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the complete, expanded is function properly in every respect.

3.5 INSTRUCTION:

A. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

3.6 ZONES

A. Zones shall be identified and scheduled on the Shop Drawing Submittal using current building designations, room names and numbers.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Section Includes:
1. Excavating, filling, backfilling, grading, and compacting of earth at the site.
2. Preparation of building pad to limits shown on plans.
3. Provide and stockpile topsoil on site.
4. Dewatering excavations.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services
2. Section 31 10 00 - Site Clearing

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM D 698-78 Tests Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Hammer and 12-in. Drop.
2. ANSI/ASTM D2922 - Density of Soil in Place by the Nuclear Methods.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Submit a one gallon sample and material analysis results of imported topsoil from a testing laboratory indicating compliance with these specifications. Any topsoil delivered to the site which does not comply with the approved sample shall be re-tested at the Contractor's expense and replaced.

C. Test Reports:
1. Submit copies of test reports in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.
2. Compaction Tests: Submit copies of compaction test reports.

1.05 QUALITY ASSURANCE

A. Laboratory Control: On site or Imported topsoil, if required, shall be inspected and tested by an independent testing laboratory.
1. Testing laboratory shall make tests of the soil from the selected source to determine that it meets the specified requirements for select fill and imported topsoil.

1.06 PROJECT CONDITIONS

A. Temporary Sheeting: Shore and sheet excavations to protect utilities and to prevent cave-in. Maintain sheeting secure until permanent construction is in place. Remove sheeting as excavations are backfilled.

B. Drainage: Provide for adequate surface drainage during construction to keep the site free of surface water without creating a nuisance in adjacent areas.

C. Pumping: Keep the excavations free of water at all times by pumping or other means. This shall be the responsibility of the Contractor regardless of the cause, source, or nature of the water.

D. Protection:
1. Property: Protect adjoining property, including improvements out-side the limits of the work. Protect walks, curbs, and paving from damage by heavy equipment and trucks.
2. Protect benchmarks.
3. Protect above and below grade utilities which are to remain.
4. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation. Monitor shoring system and surrounding ground surface during construction to detect movement. If movement becomes significant, take contingency steps to brace excavation and adjacent utility lines.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Topsoil

1. Strip topsoil from limits of grading areas, clean of grass, roots, rock and debris to a depth of 4", and stockpile for placement (6" minimum) on all landscape and "open space" areas. Contractor shall investigate the site to his satisfaction to determine if suitable material is available on site to meet the specification for topsoil.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Establish extent of excavation by area and elevation; designate and identify datum elevation.

B. Set required lines and grades using a licensed surveyor.

C. Maintain bench marks, monuments and other reference points.

3.02 PREPARATION

A. Before starting excavation, establish location and extent of underground utilities occurring in work area.

B. Notify utility companies sufficiently in advance to remove and relocate lines which are in way of excavation.

C. Maintain, reroute or extend as required, existing utility lines to remain which pass through work area.

D. Protect and support utility services uncovered by excavation.

E. Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.

F. Accurately locate and record abandoned and active utility lines rerouted or extended on Project Record Documents.

G. Upon discovery of unknown utility or concealed condition, discontinue affected work and notify Architect.

H. Remove grass, weeds, roots and other vegetation from areas to be excavated, filled and graded. Fill stump holes and like small excavations with suitable material placed in lifts and thoroughly tamped.

I. Scarify the subgrade soil of pavement areas to a minimum depth of 6 inches, water and recompact. Compact to at least 95% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content at or above the soil's optimum moisture content.

J. Scarify general subgrade soils in place to a depth of 6 inches and compact to at least 95% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content at or above the soil's optimum moisture content.

3.03 EXCAVATION

A. General: Excavate to the lines, grades and sections shown on the drawings. Allow space for the construction of forms. **All excavation shall be unclassified as required regardless of the condition or type of material encountered, including rock.**
   1. Cut areas accurately to the indicated cross-sections and grades. Take care to prevent excavation below the grades indicated. Any bottoms and slopes that are undercut shall be backfilled with earth fill and compacted.
   2. Finish the excavating required for graded areas and building pad to a tolerance of one inch above or below the rough grade.
   3. Remove underground obstructions except for piping and conduit which shall be handled as specified in SECTION 01 11 00 - SUMMARY OF WORK.

B. Over cut planting and lawn areas to allow a layer of topsoil not less than 8" thick.

C. Maintain excavations to drain and be free of excess water. Ponding of water on site will not be permitted.

D. Exercise extreme care in grading around existing trees. Do not disturb existing grades around existing trees except as otherwise noted. When excavation through roots is necessary, and after review by Landscape Architect, perform by hand and cut roots with sharp axe, prune trees to compensate for root loss.

E. Fill over-excavated areas under structure bearing surfaces in accordance with Architect's direction.

F. Do not allow construction equipment to create "pumping" of soils.

G. Stockpile excavated clean fill for reuse where directed. Remove excess or unsuitable excavated fill from site.

H. Over excavate existing soils in saturated conditions. Stockpile wet material. Allow drying out to take place. Mix stockpiled materials with relatively dry onsite material before recompacting.

3.04 WASTING

A. Surplus excavated material not suitable or required for embankment fill and backfill shall be wasted off site.

3.05 FILL AND BACKFILL

A. Filling: Construct compacted fills to the lines, grades and sections shown on the drawings.
   1. Complete stripping and wasting operations in advance of fill construction. Proof roll, compact, and establish moisture content.
   2. Deposit and mix fill material in horizontal layers not more than 8" deep, loose measurement. Manipulate each layer until the material is uniformly mixed and pulverized.

3. Fill material shall have moisture content to at least three percentage points above (+3%) its optimum moisture content and compacted to a range between 92% and 96% Standard Proctor (ASTM D698), to achieve specified compaction. If fill is too wet, dry by aeration to achieve desired moisture content. If fill is too dry, add water and mix in by blading and discing to achieve desired moisture content.
4 Exercise care to prevent movement or breakage of walls, trenches, and pipe during filling and compaction. Place fill near such items by means of light equipment and tamp with pneumatic or hand tampers.
5. Proof roll exposed subgrade in building and paving areas with heavily loaded dump truck (25 ton minimum) or similar acceptable construction equipment, to detect unsuitable soil conditions. Commence proof rolling operations after a suitable period of dry weather to avoid degrading acceptable subgrade surfaces. Make four passes over each section with proof rolling equipment, with the last two perpendicular to the first two.
5. Cut out soft areas of subgrade not readily capable of in- situ compaction. Backfill and compact to density equal to requirements for subsequent backfill material.

B. Backfilling: Construct compacted fill against and around concrete beams below finish grade.
1. Verify areas to be backfilled are free of debris, snow, ice or water, and ground surfaces are not frozen.
2. Do not backfill until underground construction has been inspected, tested and approved, forms removed, and the excavations cleaned of trash and debris.
2. Bring backfill to required grades by depositing material in horizontal layers not more than 10" deep, loose measurement.
4. Site backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.
5. Maintain optimum moisture content of backfill materials to attain required compaction density.
6. Make gradual changes in grade. Blend slopes into level areas.

3.06 COMPACTION

A. Compact each layer of earth fill and backfill to the compaction and density specified.
1. Scarify the subgrade soil of pavement areas to a minimum depth of 6 inches, water and recompact. Compact to at least 95% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content at or above the soil's optimum moisture content. Scarify general subgrade soils in place to a depth of 6 inches and compact to at least 95% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content at or above the soil's optimum moisture content.
2. Equipment for compacting shall be sheeps foot and rubber tired rollers or other compactors capable of obtaining the required density. Compact the fill with power tampers and by hand in areas not accessible to rollers.
3. Compact each layer of fill to the density listed below as a function of the location. The required density in each case is indicated as a percentage of the maximum dry unit weight determined using the standard compaction test ASTM D 698.
   a. Material under paving----------95%
   b. Material under lawn areas----------95%
   c. Material under building----------Per Geotechnical Report and Building Subgrade Preparation

3.07 GRADING

A. Site Grading: Shape and finish earthwork to bring the site to the finish grades and elevations shown on the drawings.
1. Establish grades by means of grade stakes placed at corners of units, at abrupt changes of grade, and elsewhere as may be required.
2. Rough grade for paving, and site improvements to the subgrade elevations required. Soft and unstable material which will not readily compact when rolled or tamped shall be removed and the resulting depressions filled with stable material and re-compacted.

3. Finish grade to the finish contours and spot grades shown. Extend cuts and fills to feather out beyond the last finish contour or spot grade shown. Grade to uniform levels and slopes between points for which elevations are given, round off abrupt changes in elevation, and finish off smoothly. Finish grades shall slope away from the building in all directions to assure proper drainage.
4. Execute erosion control measures in accordance with the Erosion Control Plan.

B. Grading Around Trees: Where grading is required within the branch spread of trees that are to remain, perform the work as follows:
1. When trenching occurs, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by hand digging.
2. When the existing grade at a tree is below the new finished grade, and fill not exceeding 6" is required, clean washed gravel graded from 1" to 2" size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18" and finish approximately 2" above the finished grade at the tree. Install gravel before earth fill is placed.
3. Trees in areas where the new finished grade is to be lowered shall have re-grading work done by hand to elevation as indicated. Existing grades immediately surrounding the trunk shall not be altered except at the direction of the Architect.

3.08 PROTECTION, CLEAN-UP AND EXCESS MATERIALS

A. Protect grades from construction and weather damage, washing, erosion and rutting, and repair such damage that occurs.

B. Correct any settlement below established grades to prevent ponding of water.

C. At locations where concrete or other foreign matter has penetrated or been mixed with earth, remove damaged earth and replace with clean material.

D. Remove excess stockpiled material, debris, waste, and other material from site and leave work in clean finished condition for final acceptance. Contractor is responsible for disposal of debris and excess materials.

3.09 FIELD QUALITY CONTROL

A. Compaction Tests: Field density testing of the select fill material under the building pad and paving shall be performed by an Independent Testing Laboratory.
1. Testing laboratory shall make one in place density test for each 5000 sq. ft. of area per lift in general site areas, but in no case less than two tests to ensure that the specified density is obtained. For tennis courts, ball fields, track, practice fields and competition field, the testing laboratory shall make one in place density test for each 3000 sq. ft. of area per lift, but in no case less than three tests to ensure that the specified density is obtained.
2. The cost of the full-time inspection service shall be per Specification SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

3.10 CONSTRUCTION STAKING

A. All drives must be staked using the profiles provided in the plans in addition to the grading and dimensional control plans. The contractor shall stake all vertical curves and points of grade break in order to achieve a smooth and uniform grade throughout. Verify all grades and elevations to confirm that ADA parking spaces, walks and ramps are per plans.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supply General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Section Includes: Clearing the site of vegetation, site improvements and obstructions to make way for new work.

B. Related Sections
1. Section 31 00 00 - Earthwork.

1.03 PROJECT CONDITIONS

A. Existing Conditions: Site is generally vacant, covered with some trees and native vegetation. Contractor shall visit the site and verify the nature and extent of clearing work required.

B. Protection: Contractor shall be responsible for the protection of adjoining property and improvements outside the limits of the work. Protect paving and utilities from damage by equipment and trucks.

C. It shall be the responsibility of the Contractor to obtain a temporary water meter and temporary sanitary sewer facilities for use during construction.

D. Contractor shall exercise care during operations to confine dust to the immediate work area and shall employ dust control measures to ensure adequate dust control throughout demolition and construction operations.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable building code for disposal of debris.

B. Coordinate clearing Work with previous owner and utility companies.

C. Conform to applicable portions of OSHA, including 1926.604.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged or identified

B. Locate and identify all paving and utilities intended to remain. Contractor shall field verify and coordinate with Owner and respective facility owner the location and depth of existing active facilities/ utility lines within the construction limits and shall protect all such facilities from damage during construction operations. Damage to existing facilities to remain shall be repaired at the Contractor's expense for re-establishing the facilities to their pre-damaged condition.

3.02 PERFORMANCE

A. Clearing:
   1. Remove trees, shrubs and other vegetation from within the area of the site where new construction is to be placed. Grub out roots to a depth of at least 18 inches below natural grade
   2. Dig out and remove buried obstructions to a depth of 24 inches below natural grade or 24 inches below the intended excavation elevation, whichever is lower. (Refer to landscape architect's plans and specifications)
   3. Remove existing trash, debris and abandoned facilities, which are to be removed from the site.
   4. Refer to SECTION 01 11 00 - SUMMARY OF WORK for handling of piping and conduit encountered below grade.
   5. Clear undergrowth and deadwood, without disturbing subsoil.
   6. Burning debris on site is not permitted.
   7. Remove debris, rock, fences, and extracted plant life from site.

B. Reference landscape plans and specifications for limits for tree removal and pruning/trimming limits.

C. Disposal:
   1. Clean up and remove from the site the stumps, logs, broken paving, rubble and debris resulting from the clearing and grubbing operations.
   2. Remove all traces of demolished items from the site work area and rough grade all areas that have been disturbed.
   3. Material to be wasted shall be legally disposed of off site, at no additional cost to Owner.
   4. Burning of combustible materials on the site will not be permitted.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or regraded.

B. Stockpile in a preapproved area on or near the site. Install erosion control around perimeter of stockpile.

C. Reference landscape architectural plans and specifications for additional top soil requirements.

END OF SECTION

SECTION 31 23 13

BUILDING SUBGRADE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Excavating, filling, backfilling, grading, and compacting of earth at the building site.
   1. Building foundation shall consist of:
      a. Pier and beam construction with structurally suspended concrete floor system placed on carton forms placed on grade**.**

B. Related Sections:
   1. Section 01 45 23 - Testing and Inspection Services.
   2. Section 31 10 00 - Site Clearing.
   3. Section 31 23 00 - Earthwork; Site related earthwork.
   4. Section 31 23 33 - Trenching and Backfilling.
   5. Section 31 63 29 - Drilled Concrete Piers.

1.2 SUBMITTALS

A. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit a one gallon sample and material analysis results of imported topsoil from a testing laboratory indicating compliance with these specifications. Any topsoil delivered to the site which does not comply with the approved sample shall be re-tested at the Contractor's expense and replaced.

B. Test Reports:
   1. Submit copies of test reports in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.
   2. Submit copies of test reports for select fill material. No select fill material shall be delivered to the site until after the tests have been made and test reports confirmed.
   3. Compaction Tests: Submit copies of compaction test reports**.**

1.3 QUALITY ASSURANCE

A. Laboratory Control: Select fill material and imported topsoil, if required, shall be inspected and tested by an independent testing laboratory.
   1. Testing laboratory shall make tests of the soil from the selected source to determine that it meets the specified requirements for select fill and imported topsoil.

1.4 PROJECT CONDITIONS

A. Temporary Sheeting: Shore and sheet excavations to protect utilities and to prevent cave-in. Maintain sheeting secure until permanent construction is in place. Remove sheeting as excavations are backfilled.

B. Drainage: Provide for adequate surface drainage during construction to keep the site free of surface water without creating a nuisance in adjacent areas.

C. Pumping: Keep the excavations free of water at all times by pumping or other means. This shall be the responsibility of the Contractor regardless of the cause, source, or nature of the water.

D. Protection:
   1. Property: Protect adjoining property, including improvements outside the limits of the work. Protect walks, curbs, and paving from damage by heavy equipment and trucks.
   2. Trees: Protect tops, trunks, and roots of trees on the site which are to remain. Box or fence trees vulnerable to damage during construction. Remove interfering branches with care and cover scars with tree paint. Do not permit fires, storage of materials or excavation within the branch spread of trees to remain.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Select Earth Fill: Clean soil from a selected borrow source with a Liquid Limit less than 35 and a Plasticity Index between 5 and 15. The fine content of the material should be between 25 to 55.

B. On-Site Soils: Clean on-site clay soil shall be free of rock fragments greater than 4", organic matter, and other deleterious materials and shall be compacted well. Excessive large-sized clay clods, based on the judgement of the Geotechnical Engineer, shall be avoided or conditioned.

C. Free-Draining Fill: Coarse sand or sand and gravel mixture, crushed stone, and gravel with less than 5% passing the No. 200 sieve, and less than 40% passing the No. 40 sieve. The materials passing No. 40 sieve should be non-plastic.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove grass, weeds, roots and other vegetation from areas to be excavated, filled and graded. Fill stump holes and like small excavations with suitable material placed in lifts and thoroughly tamped.

B. Scarify the subgrade soil in place to a depth of 6" and compact to a minimum of 95% of Standard Density.

3.2 EXCAVATION

A. General: Excavate to the lines, grades and sections shown on the drawings. Allow space for the construction of forms. Excavate as required regardless of the condition or type of material encountered.
   1. Cut areas accurately to the indicated cross-sections and grades. Take care to prevent excavation below the grades indicated. Any bottoms and slopes that are undercut shall be backfilled with earth fill and compacted.
   2. Finish the excavating required for graded areas to a tolerance of 0.10 foot above or below the rough grade.
   3. Over-excavate to provide a clearance of approximately the following under the soffits of slabs on void carton forms:
      a. 6" under the soffits of grade beams and pier caps
      b. 8" under the soffits of slabs
   4. Remove underground obstructions except for piping and conduit which shall be handled as specified in SECTION 01 11 00 - SUMMARY OF WORK.

3.3 WASTING

A. Surplus excavated material not suitable or required for embankment fill and backfill shall be wasted off site.

3.4 FILL AND BACKFILL

A. Filling: Construct compacted fills to the lines, grades and sections shown on the drawings.
   1. Complete stripping and wasting operations in advance of fill construction.
   2. Deposit and mix fill material in loose lifts 6 to 8**"** thick, loose measurement. Manipulate each layer until the material is uniformly mixed and pulverized.
   3. Fill material shall achieve specified compaction for each fill as provided below. If fill is too wet, dry by aeration to achieve desired moisture content. If fill is too dry, add water and mix in by blading and discing to achieve desired moisture content.
   4. Exercise care to prevent movement or breakage or walls, trenches, and pipe during filling and compaction. Place fill near such items by means of light equipment and tamp with pneumatic or hand tampers.
   5. All fill soils should be placed in consistent loose lift thickness. Each lift should be uniformly compacted with the minimum number of passes required for full compaction (i.e. when no further densification is achieved for subsequent compactor passes). Any moisture change must be achieved before compaction.

6. All completed lifts should be protected or preserved by subsequent lift coverage placed as quickly as practical. Completed lifts damaged by erosion, destructive disturbances during wet conditions should be scarified and re-compacted. Any lifts or finished fills to be exposed to weathering for a longer period should be covered and protected with sacrificial soil layers or wet matting.

B. Backfilling: Construct compacted fill against and around concrete beams below finish grade.
1. Do not backfill until underground construction has been inspected, tested and approved, forms removed, and the excavations cleaned of trash and debris.
2. Do not backfill against beams until all of the permanent structural concrete supports and bracing members are in place or until adequate shoring has been erected to prevent displacement and deflection of the beams under horizontal load. Exercise care in the placing and compacting of backfill so as not to damage the structure in any way.
3. Provide backfill for grade beams and footings. The top two feet of backfill against these walls shall be backfilled with a well-compacted, onsite clay or clay cover with a minimum thickness of at least 2 feet to retard migration of surface water into the void space.
4. Bring backfill to required grades by depositing material in consistent horizontal layers loose measurement.
5. If subgrade membrane waterproofing over concrete is installed, the Architect shall inspect the waterproofing before any backfill is placed. Do not puncture or otherwise damage the waterproofing while backfilling.

3.5 COMPACTION

A. Compact each layer of earth fill and backfill thoroughly and evenly until there is no evidence of further compaction and a solid and uniform density is secured.
1. Equipment for compacting shall be sheepsfoot and rubber tired rollers or other compactors capable of obtaining the required density. Compact the fill with power tampers and by hand in areas not accessible to rollers.
2. Compact each layer of fill to the density listed below as a function of the location. The required density in each case is indicated as a percentage of the maximum dry unit weight determined using the standard compaction test ASTM D 698.
3. Compact fill to the density and moisture content listed below:
a. Grade Beam/Utility Line/Moisture Conditioned/Flatwork Backfill: Moisture content at least 5 percentage points above optimum (+5) and compacted to at least 93% of maximum dry density.
b. Select Fill: Moisture content at optimum or above and compacted to at least 95% of maximum dry density.

3.6 GRADING

A. Grading Under Slabs:
1. Grading Under Carton Forms: Fine-grade areas under carton forms as required to achieve concrete floor slab thickness as shown and obtain required floor elevations.

3.7 FIELD QUALITY CONTROL

A. Compaction Tests: Field density testing of the select fill material under the building and paving and at perimeter grade beam shall be performed by an Independent Testing Laboratory.

B. Testing laboratory shall make one in place density test for each 2,500 sq. ft. of area per lift, but in no case less than two tests, and one test per 100 linear feet of backfill area adjacent to grade beams, to insure that the specified density is obtained.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Work Included:
1. Excavation for piped utility material.
2. Provide necessary sheeting, shoring, and bracing.
3. Comply with Federal, State, and local trench safety requirements.
4. Prepare trench bottom with appropriate materials.
5. Dewater excavation as required.
6. Place and compact granular beds, as required, and backfill.

B. Related Work Specified in Other Sections
1. Section 31 10 00 – Site Clearing
2. Section 31 00 00 – Earthwork
3. Section 33 10 00 – Water Utilities
5. Section 33 40 00 – Storm Drainage Utilities

1.03 PRECAUTIONS

A. Contractor shall determine the exact location of all utilities prior to construction.

B. Notify all utility companies when necessary to disturb existing facilities and abide by their requirements for repairing and replacing.

C. Protect all vegetation and other features to remain.

D. Protect all benchmarks and survey points.

1.04 COORDINATION

A. Where the specifications conflict with the City Water and Sewer Specification and City Standard Details for water and sewer construction, the Details and Specifications shall govern in that order.

PART 2 - PRODUCTS

2.01 BEDDING AND BACKFILL MATERIALS (ASTM D2487)

A. Reference Sitework Details and City Standard Specifications. Reference site drainage plan and NCTCOG Specification for storm drainage.

PART 3 - EXECUTION

3.01 PREPARATION

A. Install barriers and other devices to protect areas adjacent to construction and to provide for public safety.

B. Protect and maintain all bench marks and other survey points.

3.02 EXCAVATION TRENCHES

A. Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public.

B. Maximum width at the crown of the pipe shall be sixteen (16") inches plus the bell diameter of the pipe, unless approved specifically by the engineer due to unusual bracing and shoring requirements. The minimum width at the crown at the pipe shall be one foot plus the pipe bell diameter.

C. Cut pavement along neat straight lines with either a pavement breaker or pavement saw.

D. Trench Depth: For water lines - sufficient to provide minimum cover of 42 inches over the top of the pipe; for sewer lines and storm drain lines - as shown on the plans or as specified.

E. Align trench as shown on the plans unless a change is necessary to miss an unforeseen obstruction. Should such a change be necessary, the as-built information shall be provided to the engineer and it shall be approved by the engineer.

F. For water pipe, the trench shall be cut six (6") inches below the bottom of the pipe. The pipe shall be embedded in six (6") inches of granular material all around.

G. For sewer pipe, excavate six (6") inches below the bottom of pipe and fill the bottom of the trench with crushed stone or as specified by the City Standard Water & Sewer Specifications.

H. Trenches for storm drainage pipe shall be excavated and backfilled as shown on the plans.

I. When unsuitable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with coarse aggregate AASHTO M-43, Size No. 2 or 3.

J. Remove rock encountered in trench excavation to a depth of six (6") inches below the bottom of the pipe barrel, backfill with an approved material, and compact to uniformly support the pipe. In no cases shall solid rock exist within six (6") inches of the finished pipeline.

K. When rock borings or soundings are provided, they are for information only and do not guarantee existing conditions. Make such investigations as deemed necessary to determine existing conditions. All trench excavation shall be considered “unclassified excavation”, with no additional compensation.

3.03 SHEETING, SHORING AND BRACING

A. All trench excavation shall be in accordance with OSHA Regulations and Texas State law.

3.04 USE OF EXPLOSIVES

A. The use of explosives on this project is strictly prohibited.

3.05 DISPOSAL OF EXCAVATED MATERIAL

A. All excess excavated material that cannot be used, or is not suitable, shall be disposed of in a manner acceptable to the Architect, at no additional cost to owner.

3.06 UNAUTHORIZED EXCAVATION

A. No excavation outside or below the proposed lines and grades shown on the plans shall be provided unless approved by the Architect / Engineer.

B. Backfill areas of unauthorized excavation with the type material necessary (earth, rock or concrete) to insure the stability of the structure or construction involved.

3.07 REMOVAL OF WATER

A. Keep excavated areas free of water while work is in progress.

B. Take particular precautions to prevent the displacement of structures or pipelines as a result of accumulated water.

C. Discharge from dewatering activities shall not be made to any sanitary sewer system unless approved by the system operator.

3.08 OBSTRUCTIONS

A. Obstructions shown on the plans are for information only and do not guarantee their exact locations nor that other obstructions are not present. The contractor shall determine and verify the exact location of all obstructions and utilities prior to construction.

B. When utilities or obstructions are not shown on the plans but are present off the roadway at the location of the proposed pipeline route, the contractor may request to relocate the pipeline at no additional cost to the Owner in the roadway if necessary to avoid disturbing the utility or obstructions.

C. Exercise due care in excavating adjacent to existing obstructions and do not disturb same.

D. In the event obstructions are disturbed, repair or replace as quickly as possible to the condition existing prior to their disturbance. The repair or replacement shall be at no cost to the Owner.

E. If desired by the utility company, pay for the repair or replacement work performed by the forces of the utility company or other appropriate party.

F. If replacement or repair of disturbed obstructions is not performed after a reasonable period of time, the Owner may have the necessary work done and deduct the cost of same from payments to the contractor.

3.09 STORM SEWER BEDDING

A. Bedding for RCB/RCP/HDPE storm sewers shall be as specified in Section 501.6, 501.23, 504 and 508 of Standard Specifications for Public Works Construction, NCTCOG and site details.

3.10 GRAVITY SANITARY SEWER BEDDING

A. Always maintain proper grade and alignment during the bedding and tamping process.
   1. Any pipe dislodged during this process shall be replaced by the contractor at his expense.
   2. Dig bell holes to assure uniform support of the pipe.
   3. All bedding shall be tamped to a minimum of 95% maximum dry density.

B. Bedding for PVC Sewers:
   1. Refer to Sitework Details and Standard Water and Sewer Specifications.
   2. Lay sewer line on six inch (6") bed of crushed stone. Place granular material to a point twelve inches (12") above top of pipe.

3.11 BEDDING FOR WATER LINES

A. The water line shall be bedded on six (6") inches of granular material in accordance with City Water and Sewer Specifications. Compact granular material to a point six inches (6") above the top of pipe.

B. Dig bell holes to assure uniform support throughout the entire length of pipe.

3.12 INITIAL BACKFILLING

A. Do not begin backfilling before checking/inspecting the grade and alignment of the pipe, the bedding of the pipe, and the joints between the pipe. If backfill material is placed over the pipe before an inspection is made, reopen the trench in order for an inspection to be made.

B. Perform backfilling by hand, together with tamping, until fill has progressed to the top of specified embedment above the pipe.
   1. Deposit appropriate material free from lumps, clods, frozen material or stones in layers approximately eight (8") inches thick.
   2. Compact by hand, or with manually operated machine tampers actuated by compressed air or other suitable means.
   3. Use tamps and machines of a suitable type which do not crush or otherwise damage the pipe.

3.13 FINAL BACKFILLING

A. After placement of the granular embedment material has been achieved, perform final backfilling depending upon the location of the work and danger from subsequent settlement.

B. Backfilling beneath existing or proposed driveways, streets, sidewalks, parking areas or any paved area:
   1. Use granular material to backfill trenches.
   2. Carefully deposit in uniform layers, not to exceed six (6") inches thick.
   3. Compact each layer according to Standard Proctor density of 95 percent by rolling ramming and tamping with tools suitable for that purpose in such a manner so as to not disturb the pipe. Moisture must be within +3 percentage points above optimum during compaction.
   4. At 200' intervals in the trench, clay check dams shall be installed to inhibit the piping of surface and/or subsurface water. The contractor shall compact full depth two foot (2') clay check dams at each location the trench enters or exits a pavement.
   5. Jetting or ponding of native material backfill will not be allowed.

3.14 FIELD QUALITY CONTROL

A. Compaction Tests: Field density testing of the completed trench backfill shall be performed by an Independent Testing Laboratory.
   1. The Laboratory shall make one density test for each 150 linear feet of trench, with a minimum of 1 tests per lift.

END OF SECTION

SECTION 31 31 00

SOIL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Application of soil chemicals for the prevention of termite infestation.

B. Related Sections:
   1. Section 07 26 00 - Vapor Retarders

1.2 SUBMITTALS

A. Product Data: For termiticide.
   1. Include the current EPA-Registered Label for termiticide products.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Work shall be performed by a licensed, reputable, pest control operator with an established record of at least five years successful experience in this work.

B. Regulatory Requirements: Application of soil treatment shall meet the requirements of regulatory organizations.
   1. Texas Department of Agriculture, Structural Pest Control Service, Austin, TX.
   2. Formulate and apply termiticides according to the EPA-Registered Label.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-registered label.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard from, signed by application and contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites for a period of 5 years from date of substantial completion. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

PART 2 - PRODUCTS

2.1 2.1 SOIL TREATMENT SOLUTION

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of Texas Department of Agriculture, Structural Pest Control Service, Austin, TX, in an aqueous solution formulated to prevent termite infestation. Solution shall include synthetic dye to permit visual identification of treated soil. Product/manufacturer; one of the following:
   Demon MAX; Syngenta
   BaseLine™ or Dragnet SFR; FMC Corp., Agricultural Products Group

B. Dilute termiticide as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION/PREPARATION

A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb termiticide, ready to receive treatment.

B. Beginning of application means acceptance of soil conditions.

C. Notify Architect and Owner at least 12 hours prior to beginning work.

3.2 APPLICATION

A. Apply termiticide to soil at metered rates, in accordance with manufacturer's instructions or as indicated below if more stringent.

B. Applying Chemicals: Apply the solution not more than 24 hours prior to placing concrete slabs and at such time as there is reasonable assurance that no rain will fall until after the slabs have been placed.
   1. Vertical Barrier:
      a. Establish a vertical barrier in areas around the base of footings, foundation walls, grade beams, plumbing, piers, and backfill soil. Treat both sides of footings, walls, beams, and around all sides of pipes and piers.
      b. Apply at the rate of 4 gallons of emulsion per 10 linear feet per foot of depth from grade to the top of footings or the bottom of beams as each demands.
      c. Applications must be made by rodding and/or trenching in accordance with manufacturer's application instructions.
      d. Cover the treated soil with a thin layer of untreated soil or other suitable barrier such as polyethylene sheeting.
      e. Apply extra treatment to structure penetrations, pipe, ducts, expansion joints and other soil penetrations.
   2. Horizontal Barrier:
      a. Establish a horizontal barrier under concrete slabs on carton forms. Apply emulsion at the rate of 1 gallon per 10 square feet of grade.
      b. Applications shall be made by a low pressure spray.
      c. If concrete slab cannot be poured over the soil the same day it has been treated, cover treated soil immediately after application with polyethylene sheeting (Section 07 26 00 - Vapor Retarders) to prevent disturbance of the termiticide barrier. This protective vapor retarder shall be removed prior to the placement of void boxes. Vapor retarder will be placed on top of the void boxes**.**

C. Post signs in the areas of application warning workers that soil poisoning has been applied. Signs shall remain in place until areas are covered by other construction.

END OF SECTION

SECTION 31 63 29

DRILLED PIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Drilling and cleaning pier holes
2. De-watering of shafts and removal of spoil
3. Casing pier holes

B. Products Installed, Not Furnished Under This Section
1. Concrete and reinforcing steel
2. Anchor bolts, templates and dowels

C. Basis for Bids
1. Base Contract Price on number and base depth of piers as shown on Drawings.
2. Include temporary casing in Base Contract Sum for drilled piers.
3. Pay depth of straight shaft piers shall be calculated as the sum of the measured depth from ground surface to the top of the bearing stratum, plus the depth that casing is required to extend below the top of the bearing stratum, plus the required penetration into the bearing stratum.
4. No additional depth of drilling will be included in the pay depth unless required in writing by the inspecting agency.

D. Unit Prices
1. Piers: provide add and deduct unit price per lineal foot shorter or longer than bid depth.
a. Above bearing stratum.
b. Within bearing stratum.
2. Casings: provide add and deduct unit price per lineal foot for installation and removal of temporary steel casings. Unit price shall be based upon actual length of temporary steel casing as measured from ground elevation to bottom of casing.
3. Unit prices shall be for complete unit of work including labor, materials, overhead, taxes and profit.

1.2 REFERENCES (Latest Edition)

A. Specifications of the Association of Drilled Shaft Contractors.

B. American Concrete Institute (ACI)
1. ACI 336.1: "Standard Specification for Construction of End Bearing Drilled Piers"
2. ACI 336.3: "Suggested Design and Construction Procedures for Pier Foundations"

1.3 SUBMITTALS

A. Pier Log: for each pier record the following:
1. Identification mark
2. Shaft diameter
3. Top of bearing stratum elevation
4. Bottom of pier elevation
5. Penetration of bearing stratum
6. Pier reinforcing (vertical bars and ties)
7. Steel cage length
8. Depth and diameter of casing, where casing required
9. Top of Pier Elevation
10. Concrete quantity
11. Date and time drilling completed
12. Date and time concrete placement begun and completed
13. Plumbness variation
14. Condition of drilled hole before placement of concrete

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Contractor: at least 3 years of experience in similar applications.
      a. Experience shall be relevant to anticipated subsurface materials, water conditions, shaft sizes and special techniques required.
   2. Demonstrate to Architect dependability of equipment and techniques to be used, when requested.

B. Drilled pier construction shall conform to requirements of ACI 336.1, except as modified by requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store reinforcing cages off of ground and protect from contamination of dirt, grease and corrosion.

B. Deliver concrete to site in timely manner and in sufficient quantities to allow concreting of each pier as monolithic unit.

C. Coordinate delivery of concrete to allow placement to begin within 8 hours of completion of drilling.

PART 2 - PRODUCTS

2.1 MATERIALS - Refer to related sections for materials installed, not furnished under this section.

2.2 FABRICATION

A. Prior to drilling pier holes, fabricate reinforcing cages in stock lengths suitable for cutting to required lengths. Bend reinforcing as detailed.
   1. Do not splice vertical reinforcing..
   2. Do not use cross wire ties that would interfere with tremie pipe or concrete free falling down the center of the cage.
   3. Spacers: provide steel band spacers or precast concrete spacers to maintain position of cages within pier holes.
   4. End blocks: provide precast concrete end blocks to maintain required clearance at bases of cages.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation, review the subsoil investigation report for site provided by Owner; become thoroughly familiar with anticipated subsoil conditions.

B. Examine site for obstructions to drilling, such as power lines, utilities, material stockpiles, boulders and uneven surfaces. Report anticipated problems to Architect in timely manner so as not to delay schedule of Work.

3.2 PREPARATION

A. Have ready at site equipment anticipated to be necessary for successful installation of piers, including power augers, core barrels, tremies, hoppers, chutes, and casing, as applicable.

B. Maintain in ready condition dowels, templates, and anchor bolts required for pier installation.

3.3 INSTALLATION

A. Drilling Straight Shaft Pier Holes
   1. Drill pier holes with power augers or core barrels suitable for subsoil conditions at site.
   2. Drill pier holes of required diameters to bearing stratum and penetrate bearing stratum to required depths below top of stratum.

3. Where casing is required, increase pier hole diameter as necessary to accommodate casing having inside diameter not less than required shaft diameter to depth necessary to seal shaft.
4. Where casing is required, measure required depth of penetration into bearing stratum from top of stratum or from bottom of casing, whichever is deeper from ground surface.

B. De-watering Pier Holes
1. Remove standing water from pier holes to within 3 inches of base of holes by bailing or pumping.
2. Where flowing water is encountered, or required water level cannot be maintained, use casing.

C. Casing Pier Holes
1. Where flowing water or caving soil is encountered use temporary casings to seal sides of shaft.
2. Casings shall be steel, and of adequate strength to withstand handling stresses and concrete and earth pressures, and shall be watertight.
3. Extend casings only to depth required to seal off water or caving soil.
4. Extract casings in vertical lifts, maintaining adequate head of concrete to prevent caving of soils. Do not rotate casing during removal.

D. Placing Reinforcing Cages, Dowels and Anchor Bolts
1. Place reinforcing steel cages accurately in shafts and hold in position during placement of concrete.
2. Place dowels and anchor bolts in position, and maintain proper location and elevation with templates.
3. Use steel bars and bands as required to maintain position of scheduled pier reinforcing within cage.
4. Use spacers to maintain position of cage within shaft and to maintain minimum 3 inches of concrete cover.
5. Use end blocks to support cage at required elevation maintaining proper clearance at base of pier.

E. Placing and Consolidating Concrete
1. Clean pier shafts of accumulated loose material before concreting, and remove water to within 3 inches of base of shaft.
2. Place concrete within 8 hours of drilling.
3. Place concrete using a collection hopper with a steel outlet pipe to direct concrete down the center of the shaft. Placing concrete directly into the shaft from concrete truck chute is not allowed.
4. Extend tremie pipe as required to limit concrete free fall height as follows:
   a. Shaft diameter 18 inches or less: 10 feet max free fall
   b. Shaft diameter 20 to 30 inches: 30 feet max free fall
   c. Shaft diameter 32 inches or larger: 60 feet max free fall
5. Place concrete in one continuous operation for each pier.
6. Consolidate top 6 feet of each pier with concrete vibrator.
7. Where water rises to top of pier during placement, remove over-wetted concrete and replace with sound, dense material.
8. Remove and replace portions of concrete that become contaminated with mud or spoil material during placement.
9. Where tops of pier holes become mushroomed during drilling or installation procedures, use round forms to maintain constant diameter.

F. Tolerances
1. Maximum lateral variation off centerlines: 3 inches
2. Plumbness of vertical piers within 1 ½ percent of shaft depth to bearing stratum.
3. Shaft diameter: plus 2 inches, minus 0
4. Top of pier elevation: plus one inch, minus 3 inches
5. Penetration of bearing stratum: minus 0, plus 1 foot.
6. Placement of vertical dowels at tops of piers: plus or minus 1 inch lateral, plus or minus 4 inches vertical.
7. Placement of anchor bolts: plus or minus 1/4 inch lateral, plus or minus 1 inch vertical.

3.4 FIELD QUALITY CONTROL

A. Testing Laboratory and Inspection Services
1. Inspect drilling of each pier hole.
   a. Determine location of required bearing stratum, measure depth from ground surface.
   b. Measure overlap of casing into the bearing stratum.
   c. Measure depth of penetration into stratum.

d. Measure shaft diameter. Measure casing diameter where casing required.
e. Inspect condition of base prior to concreting.

2. Inspect reinforcing cages
   a. Check bar sizes and quantity.
   b. Check tieing and splicing of cages.
   c. Monitor placement and securement techniques.
3. Monitor concrete placement
   a. Monitor time interval between drilling and placement.
   b. Inspect placement techniques and conditions.
   c. Inspect concrete quality at tops of shafts.
4. Material Tests: refer to sections for products installed, not furnished under this section.
5. Field Conditions: where un-anticipated subsurface conditions prevent proper installation of piers, do not proceed with work until directed by Architect.

B. Adjusting
1. Piers for which time lapse between drilling and concreting exceeds maximum shall be reamed, or penetration re-drilled as determined by Architect at no additional cost to the contract.
2. Piers installed without required inspection shall be replaced as directed by Architect at no additional cost to the contract.
3. Pier installations suspect of deficient quality shall be tested and/or corrected as directed by Architect at no additional cost to Owner.
4. Pier shafts drilled deeper than required penetration into bearing stratum shall be filled with unreinforced concrete to the required penetration depth at no additional cost to the contract.
5. If pier shafts are larger than required diameter, except where casing is required, provide additional vertical reinforcing as may be instructed by Architect at no additional cost to the contract.
6. Remove mushrooms - before concrete cures, remove excess concrete from tops of piers so that pier shafts are of constant diameter.

C. Clean-up
1. Remove spoil and debris from the site and legally dispose.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Section Includes: New concrete walks, curbs and gutters, paving, approaches, and other concrete flatwork outside the building.

B. Related Sections:
1. Section 31 00 00 - Earthwork

1.03 REFERENCES

A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

B. ACI 305 - Recommended Practices for Hot Weather Concreting.

C. ACI 306 Recommended Practices for Cold Weather Concreting.

D. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

E. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

F. ASTM C309, Type II – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

G. NCTCOG - Standard Specifications for Public Works Construction.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. City Standards: Street sidewalks, curbs and gutters, and approaches shall be constructed to meet or exceed the requirements of the City standard specifications (or NCTCOG) where the City standards are applicable.

1.05 SUBMITTALS

A. Product Data: Submit concrete mix designs in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Include data on joint filler, admixtures and curing compounds.

C. Submit manufacturer's instructions under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

D. Confirm proposed joint layout shown on plans; submit revised layout for approval prior to starting work.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place pavement when base surface or ambient temperature is less than 40 degrees F, or if base surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cements: ASTM C 150, Type I, domestic manufacture.

B. Fly Ash: ASTM C 618, Class F or C.

C. Fine Aggregate: ASTM C 33, washed sand with a fineness modulus of between 2.50-3.00.

D. Coarse Aggregate: ASTM C 33, clean crushed stone or washed gravel. The nominal maximum particle size shall not exceed 1/5 of the narrowest dimension between forms or ¾ of the minimum clear spacing between reinforcing bars.

E. Admixture: ASTM C 494, Types "A", "D" and "E", water reducing, chloride-free admixture. Product manufacturer; one of the following:
PSI; Gifford-Hill & Co., Inc.
Pozzolith; Master Builders
Plastocrete; Sika Chemical

F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures, equal to Master Builders "Micro Air".

G. Water: ASTM C 94, Clean and potable.

H. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

I. Formwork:
1. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
2. Use flexible or curved forms for curves of a radius 100 feet or less.
3. Use forms of size and strength to resist movement during concrete placement.
4. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

J. Reinforcement:
1. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
2. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs. Provide with closed sleeves at one end to allow one inch movement.
3. Tie Bars: ASTM A 615, Grade 60, deformed.
4. Bar Supports: chairs for spacing, supporting, and fastening reinforcement bars, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from plastic to support bars at the proper depth per the details.

K. Concrete shall meet the requirements specified in plans and specification. Paving and 5”/6” flatwork shall be 5.5 sack of cement content per cubic yard with a minimum compressive

strength of 4000 psi at 28 days and 3000 psi at 28 days for 4" flatwork. (Entrained Air: 3-6%, Slump: 3-5 inches, Fly Ash Replacement – 20% max).

L. Expansion Joint Filler:
1. ASTM D 1751 preformed strips of asphalt saturated cane fiberboard for joints in standard finished flatwork (walks, curbs and gutters).
2. ASTM D 1752, Type I preformed strips of elastic sponge rubber compound for joints to be caulked with sealant and joints in architectural concrete flatwork.
3. The use of redwood expansion joints is prohibited.

M. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
Product manufacturer; one of the following:
Crafco Inc.; RoadSaver Silicone SL.
Dow Corning Corporation; 890-SL.

N. Joint Sealant Backer Rod:
1. Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
2. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.02 MIXING AND DELIVERY

A. Measurement of concrete materials, mixing, and delivery of fresh concrete to the project shall meet the requirements of ASTM C 94. Transit-mixed concrete supplier shall have a plant with sufficient capacity and transportation facilities to assure continuous delivery at the rate required.

B. Mix concrete in accordance with ASTM C94, Alternative No. 2, or ACI 304.

C. Deliver concrete in accordance with ASTM C94.

D. Select proportions for normal weight concrete in accordance with ACI 301 Method 1. Mix not less than one minute after materials are in mixer.

E. Do not transport or use concrete after 90 minutes has expired from time of initial mixing.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade is ready to support paving and imposed loads, free of frost, smooth and properly compacted.
B. Verify gradients and elevations of base are correct, and proper drainage has been provided so that water does not stand in the area to receive paving.

C. Beginning of installation means acceptance of existing conditions

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Architect, Owner, and testing laboratory, minimum 24 hours prior to commencement of concreting operations.

C. Grade Control: Establish and maintain the lines and grades for concrete site work items by means of line and grade stakes. Complete any fine grading required to prepare the subgrade. Maintain the finished subgrade cushions in a satisfactory condition.

3.03 INSERTS AND ACCESSORIES

A. Make provisions for installation of inserts, accessories, anchors, and sleeves.

3.04 INSTALLATION

A. Forming: Set forms to lines and grades, and brace and secure to withstand wet concrete without deflection or leakage. Stake forms securely in position with joints keyed to prevent relative displacement. Clean and oil forms each time they are used. Refer to Section 03 11 00 for additional installation requirements.
   1. Walks: 4" – 6" thick. Surfaces shall be crowned or sloped to drain.
   2. Curbs and Gutters: As detailed.
   3. Paving, Drive Approaches: Thicken edges as required.
      a. 5" thick – Light-Duty Parking Areas Traffic (Parking Areas)
      b. 6" thick – Medium-Duty Parking Areas (Drives and Fire Lanes)
      c. 7" thick – Service Docks and Dumpster Areas

B. Reinforcing: Install reinforcing to meet the requirements of SECTION 03 2000 - CONCRETE REINFORCEMENT. Where reinforcement is not specifically detailed, reinforce pavement and flatwork with #3 rebars at 18" o.c. each way.

C. Concrete: Place concrete to meet the requirements of SECTION 03 3000 - CAST-IN-PLACE CONCRETE.
   1. Place concrete in accordance with ACI 301 and 304. Deposit concrete so that specified slab thickness will be obtained with use of a vibratory screed and finishing operations. Minimize handling to prevent segregation. Consolidate concrete by suitable means to prevent formation of voids or honeycombs. Exercise care to prevent disturbance of forms and reinforcing and damage to vapor retarder. Place concrete to lines and levels shown, properly sloped to drain into adjacent yard areas or drainage structures. **The vibratory screed shall run along the forms for all paving areas except intersections. The use of a hand-held vibratory screed may be used at intersections. If concrete pavement areas will be hand-poured, contractor shall have adequate hand-held concrete vibrators (2 minimum) during construction.** The surface shall be troweled and edged with a steel trowel and then broomed to obtain a smooth, uniform brush finish.
   2. Hot Weather Placement: ACI 305.
   3. Cold Weather Placement: ACI 306.
   4. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
   5. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
   6. **The Contractor shall not back over the steel at any time while pouring concrete. Construction sequencing efforts shall be utilized in order to successfully make each concrete pour. If necessary, the Contractor shall utilize concrete pumping to perform the work.**

D. Expansion Joints: Locate expansion joints around fixed objects within or abutting concrete, and at intervals of not more than 35 ft. o.c. along walks and curbs and 150 ft. o.c. along drive and parking paving unless otherwise shown on the plans.
   1. Install preformed filler with the top edge approximately 1/4" below the finished concrete surface to leave a neat, straight joint.
   2. Joints shall be ½" wide unless specifically dimensioned otherwise on the drawings. Joint edges shall be rounded with an edging tool.

3. There shall be no connection by reinforcement or keyway across expansion joints. Joints shall be held in alignment with sleeved, smooth dowels where required.
4. The use of redwood expansion joints is prohibited.

E. Scoring:
1. Saw cut walks, approaches, and paving using an abrasive or diamond blade. Cut joint width shall be 1/8" and depth shall be 1/4" deep at walks and 1/3 slab thickness at approaches and paving. Cutting of joints must be done as soon as concrete surface is firm enough not to be torn or damaged by the blade (within 4 to 12 hours), and before random shrinkage cracks can form in the concrete slab.

a. Score walks at approximately 5-foot intervals each way. Where walks abut curbs, the scoring of walks and curbs shall align.
b. Score curbs and curbs and gutters at approximately 5-foot intervals.
c. Score approaches and paving at approximately 10-foot intervals each way or as shown.

F. Standard Finishing: Strike slabs off true by double screeding to the required level at or below the elevations and grades shown on the drawings. Set edge forms and screed strips accurately to produce the designated elevations and contours.
1. Walks: Float with wood floats to true planes with no coarse aggregate visible. Hand trowel to produce smooth surfaces. Brush surfaces with a soft fiber brush to produce a uniformly striated finish. Edge concrete surfaces with a rounded edging tool.
2. Curbs and gutters: All curbs shall be formed and finished with a preformed mechanical mule. No hand formed curbs shall be allowed except in those areas that require transitioning to a laydown curb, inlet or radii less than 4 feet. Cross brush surfaces with a soft fiber brush to produce a fine brush finish.
3. Approaches: Screed and float to a monolithic medium float finish and belt with a canvas belt to produce a herringbone texture finish.
a. Curb Ramps: Provide tooled grooves with chemical staining of concrete as detailed.

G. Curing:
1. Cure concrete 7 days. Coat exposed surfaces with **white pigmented** curing compound and protect surfaces from pedestrian and vehicular traffic during the curing period. Damaged areas shall be re-sprayed. Curing compound shall conform to the specifications of ASTM C309, Type 2.

2. Removing Forms: Forms shall remain in place for at least 12 hours after concrete has been placed and finished. Remove forms without damaging the concrete. Bars and heavy tools shall not be used to pry against the concrete in removing the forms. Backfill all curbs.

3.05 FIELD QUALITY CONTROL

A. Concrete Tests: Testing and acceptance of concrete shall meet the requirements specified in the plans and specifications and by the geotechnical firm.

B. Grade and Smoothness Tests:
1. Plan Grade: Finished surface of the flatwork shall not vary more than 0.04 ft. above or below the plan grade or elevation. Finished surfaces of abutting pavement and walks shall coincide at their juncture. Where a new pavement or walk abuts an existing surface, transition pavement or walk strip shall be installed.
2. Surface Smoothness: Finished surface of the flatwork shall have no abrupt changes of more than 1/8" and shall not deviate from the testing edge of a 12 ft. straight edge more than 1/4" plus or minus tolerance. Flow line of gutters shall not deviate from the testing edge of a 10 ft. straight edge more than 1/8" plus or minus tolerance.

C. **Concrete Cracking:**
Contractor is responsible for controlling all concrete cracking. If more than one (1) crack per panel occurs, the Contractor may be required to remove and replace the panel as directed by the Engineer or Owner.

3.06 CLEANING

A. Remove debris, scraps, surplus materials, tools and equipment from the premises upon completion of the work. Clean concrete droppings from walks and curbs. Leave the graded areas free of debris and rubble.

3.07 PROTECTION

A. Immediately after placement, protect concrete under provisions of SECTION 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. The pavement shall be closed to all traffic, including vehicles of the Contractor, until the concrete is at least 7 days old or has attained a minimum average of 3,000 psi compressive strength. Repair any damage to the pavement prior to the acceptance by Owner at no additional cost to the Owner. This does not relieve the Contractor from the normal liabilities, and maintenance responsibilities, implied or otherwise, for the pavement or other items.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A . Section Includes: Pavement marking on Portland Cement Concrete Pavement.

B. Related Sections:
1. Section 32 13 13 - Concrete Paving

1.03 REFERENCES

A. Federal Specification (FS):
1. FS - TT-P-115E Paint, Traffic, Highway, White and Yellow.

1.04 PROJECT CONDITIONS

A. Environmental Requirements Apply paint when ambient temperature is 50°F. or above, and relative humidity is below 85%.

1.05 QUALITY ASSURANCE

A. Installer: Shall have a minimum of 2 years' experience in the layout and striping of parking lots.

B. Job Conditions: Do not apply marking paint when weather is foggy or rainy, or ambient or pavement temperatures are below 40 degrees F., nor when such conditions are anticipated during eight hours after application.

1.06 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Substitutions: Submit in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Traffic Paint: Fed. Spec. TT-P-115E, Type III alkyd-chlorinated rubber-chlorinated paraffin marking paint. Striping colors per plans and City requirements. Provide Premium Chlorinated Rubber Base Paint as manufactured by Highway Signs & Paint, Inc. (phone 214 446-1605), or approved equivalent.

B. Cleaning Solvent: VM & P Naphtha.

2.02 EQUIPMENT

A. Applicators: Hand-operated push type marking machine or conventional airless spray equipment with guide lines and templates.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Conditions: Clean and dry free from dirt, loose paint, oil, grease, wax, and other contaminants.
   1. Asphalt Surfaces: Allow asphaltic concrete to cure a minimum of 48 hours prior to application of marking paint.

B. Equipment Condition: Clean previously used paint and solvent from application equipment, using VM & P Naphtha.

C. Paint: Stir contents thoroughly from bottom of container. Do not thin paint.

D. Locate markings as indicated on Drawings. Provide qualified technician to supervise equipment and application of markings. Lay out markings using guide lines, templates and forms.

E. Allow paving to cure before painting as required by manufacturer of traffic paint.

F. Allow protective coating to cure a minimum of 48 hours prior to application of traffic paint.

3.02 APPLICATION

A. Using approved equipment, apply paint to a minimum thickness of 15 mils. Stripes shall be 4" wide. Marking edges of stripes and symbols shall be sharply outlined.

END OF SECTION

SECTION 32 1816.13

PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes
   1. Protective surfacing for playground area.
   2. Subbase under resilient surfacing.

B. Related Requirements
   1. Section 03 30 00 - Cast-in-Place Concrete.
   2. Section 11 68 13 - Playground Equipment: Playground layout (staking).

1.2 REFERENCE STANDARDS

A. ASTM D2047 - Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine; 2011.

B. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2009.

C. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2011.

D. CPSC Pub. No. 325 - Public Playground Safety Handbook; Consumer Products Safety Commission; 2010.

1.3 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

F. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.4 SUBMITTALS

A. See Section 01 33 23 - Shop Drawings, Product Data, And Samples for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.
   1. Include IPEMA certifications where required.
   2. Treated Wood Products: Provide information on wood treatment chemical content, toxicity level, and life-cycle durability.

C. Product Data: For natural surfacing materials, provide supplier's certification or mill certificate showing compliance with specified requirements.

D. Shop Drawings: Detailed scale drawings showing locations of existing playground equipment and exposed footings, bases, and anchorage points.
   1. Clearly identify footing and base elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing, surveyed by land surveyor licensed in Texas.
   2. Show locations of underground utilities, storm-drainage system and irrigation system.
   3. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
   4. Show measured fall height for each playground equipment item, determined in accordance with ASTM F1487.
   5. Show Use Zone perimeters, determined in accordance with ASTM F1487.

E. Samples: For each product for which color must be selected provide color chart showing full range of colors.

F. Samples: Provide actual material samples for loose fill sealed in a container, geosynthetic fabric, and molded-sheet drainage panel.

G. Percolation Test Report: Describing test method used and results.

H. Maintenance Data:
   1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.
   2. For loose fill surfacing products, provide detailed re-ordering information to enable Eagle Mountain-Saginaw ISD to match installed material exactly.

I. Manufacturer's Field Report.

J. Certifications: Provide certifications complying with ASTM 1292 and ASTN 1951.

1.5 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than five years of documented experience.
   1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.
   2. Provide certificate of Insurance AA rated for minimum 1,000,000 dollars covering both product and general liability.
   3. Manufacturer's Representative: Provide name, company name and address, and qualifications.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing the protective surfacing; provide installer's company name and address, and training and experience certificate.

1.6 PRE-INSTALLATION MEETING

A. Convene a meeting two before starting earthwork for playground to discuss coordination between various installers.
   1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
   2. Include representatives of Contractor.
   3. Notify Architect at least 2 weeks prior to meeting.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.8 WARRANTY

A. Reference Section 01 78 30 - Warranties and Bonds, for additional warranty requirements.

B. Provide minimum 6 year warranty for playground surfacing.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. All materials and surfacing shall be coordinated and installed under a single source as specified in Section 11 68 13 - Playground Equipment.

B. Because the safety of the playground depends on strict conformance to the design criteria, this information is provided for Contractor's information.
   1. The protective surfacing constitutes a resilient layer installed over the subgrade, with the top of playground equipment footings and anchorage devices located below the surface of the subgrade.
   2. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
   3. Use Zone: The protective surfacing has been designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height of 14 feet.

C. Accessibility: Provide playground surface system determined to be accessible when tested according to ASTM PS 83 and design to comply with requirements for an accessible route as recommended by ANSI A117.1 U.S. Architectural & Transportation Barriers Compliance Board's "ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)" for systems designated.

2.2 MATERIALS

A. Poured-In-Place Membrane Surfacing: Weather-resistant wear layer over rigid concrete subbase.
   1. Wear Layer: Ethylene propylene diene monomer (EPDM) particles adhered with a ultraviolet-stabilized polyurethane binder to produce an even, uniformly colored surface.
   2. Wear Layer Thickness: 3/8 inch, minimum.
   3. Coefficient of Friction, when wet: 0.8, minimum, when tested in accordance with ASTM D2047.
   4. Wear Layer Color(s): As selected from manufacturer's full range of bright colors.
   5. Accessories: Provide manufacturer's standard containment curbs and tapered transition elements to support surfacing between changes of surface grade.

B. Engineered Wood Fiber Fill: Manufactured for the purpose of protective surfacing; complying with ASTM F2075; do not use mulch manufactured from recycled pallets, or lumber containing nails or metal fasteners.
   1. Depth: 12 inches, maximum.
   2. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.

C. Playground Safety Mat
   1. Protect and support washout areas of play events such as slide exits, under swings, and playground access and egress points where loose fill material disbursement becomes problematic.
   2. Composition: 100% recycle rubber buffing. No whole tire granulated rubber, containing fiber and steel by-products will be accepted. Matting must weigh no less than 45 pounds per mat unit to create an ultra stable, vandal proof unit.
   3. Size: 3'x5'x2" beveled at all four edges, weight: 120 lbs. manufactured in a single density fabrication with beveled edges which bury either partially or completely under loose fill material without creating a trip hazard.
   4. Properties: Mat must be anti-fungal, non-absorbent, non-toxic, and must not promote nesting of insets.
      a. Under and in front of slide exits.
      b. Under and around swings.
      c. At finished grade around transfer stations at accessible perimeter.
      d. At high-traffic areas and playground equipment where indicated on Drawings.
      e. Size: 48 inches x 48 inches (1200 x 1200 mm).
      f. Color: As selected from manufacturer's standard range.

D. Geotextile Fabric: Nonwoven drainage/separation fabric as indicated by the manufacturer..

E. Rigid Subbase: Concrete, as specified in Section 03 30 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment and site furnishings and irrigation system located within playground area are complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.2 PREPARATION

A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

D. Install containment curbs with top surface flush with intended elevation of top surface of protective surfacing.

3.3 SUBBASE

A. Install concrete subbase as indicated on drawings and in Section 03 3000.
   1. Remove curing compounds and other substances that will adversely affect adhesion.

B. Install with top surface of subbase no higher than grades and levels indicated and not more than 1/4 inch lower than grades and levels indicated.

C. Install in true, even plane, sloped to provide positive drainage.

D. Flatness Tolerance: 1/4 inch in 10 feet, maximum.

E. Cure subbase at least 7 days but not less than required by manufacturer of resilient surfacing.

3.4 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction.

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Cover aggregate subbase with geotextile fabric:
   1. Verify that aggregate is free of ruts or protruding objects.
   2. Lap minimum 4 inches width at seams. Adhere seams in accordance with manufacturer's recommendations.
   3. Install fabric smooth, and free of tensile stresses, folds, or wrinkles.
   4. Protect fabric from clogging, tears, or other damage during surfacing installation.
   5. Repair or replace damaged fabric in accordance with manufacturer's recommendations.

E. Poured In Place Surfacing:
   1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
   2. Install seamlessly; ensure complete bond to subbase.
   3. Cover footings and foundations and adhere tightly around penetrating elements.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary Conditions of the Contract, Division 1 – General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SCOPE

A . Section Includes: Galvanized steel chain link fences and gates. Contractor shall obtain chain link fences as complete units, including necessary erection accessories, fittings and fastenings from a single source or manufacturer.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
0. ASTM A 153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A 392 – Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
3. ASTM A 446 – Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
4. ASTM A 569 – Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
5. ASTM A 641 – Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
6. ASTM A 824 – Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.
7. ASTM C 33 – Specification for Concrete Aggregates.
8. ASTM C 150 – Specification for Portland Cement.
9. ASTM F 567 – Practice for Installation of Chain-Link Fence.
10. ASTM F 669 – Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.
11. ASTM F 900 – Specification for Industrial and Commercial Swing Gates.
12. ASTM F 1083 – Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

B. Chain Link Fence Manufacturer's Institute (CLFMI) Publications:
1. Product Manual

1.04 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Include manufacturer's installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide chain link fences and gates as manufactured by one of the following:
Allied Tube and Conduit Corp.
American Chain Link Fence Company
American Tube Company
Anchor Fence, Inc.
Capitol Wire and Fence Co., Inc.
Century Tube Corp.
Cyclone Fence Div./USX Corp.

2.02 MATERIALS

A. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 12' high. All fencing shall have a knuckled selvage top and bottom. Wire size includes zinc coating.

a. Fabric sizes:
1. Fencing: 2-inch mesh, 0.148-inch diameter (9 gauge).

B. Galvanized Steel Finish: ASTM A 392, Class 1, with not less than 1.2 oz. Zinc per sq.ft. of uncoated wire surface.

C. Framing: Strength requirements for posts and rails shall comply with ASTM F 669.

D. Pipe shall be straight, true to section, material and sizes specified and shall conform to the following weights per foot:

NPS in Inches	Outside Diameter (OD) in inches	Type I Steel (lbs./ft.)
1 ¼	1.660	2.27
1 ½	1.900	2.72
2	2.375	3.65
2 ½	2.875	5.79
3 ½	4.000	9.11
6 ⅝	6.625	18.97

E. Steel Framework, General: Posts, rails, braces and gate frames.

1. Type I Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.

F. End, corner and pull posts: Size as indicated on the plans.

G. Line or intermediate posts: Size as indicated on the plans.

H. Top Rail: Manufacturer's longest lengths, with expansion-type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate corner, pull and end post.

1. Galvanized Steel: 1 ¼" NPS (1.66" OD) Type I steel pipe.

I. Tension Wire: ASTM A 824, 0.177" diameter metallic-coated steel marcelled tension wire with finish to match fabric.

J. Tie Wires: 0.148-inch diameter (9 gauge) aluminum wire alloy 1350-H19 or equal.

K. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.

L. Tension or Stretcher Bars: Hot-dip galvanized steel with minimum length 2" less than full height of fabric, minimum cross-section of 3/16" by ¾" and minimum 1.2 oz. zinc coating per sq. ft. of surface area. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

M. Tension and Brace Bands: Minimum ¾" wide hot-dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.

1. Tension and Brace Bands: Minimum 12 gauge (0.105") thick.

N. Gates:
1. Gate frames shall be constructed of 2" o.d., Schedule 40 steel pipe secured at corners with malleable iron or pressed steel ells, riveted with four rivets per ell. Frame shall be hot-dip zinc coated after fabrication.
2. Welded gate frames are unacceptable.
3. Internal bracing shall be 3/8" diameter galvanized truss rods with tighteners.
4. Hinges shall be pressed steel or malleable iron. Bottom hinge shall be a ball and socket type. All gates shall allow for a one hundred eight (180˚) degree swing.
5. Gates shall be equipped with a heavy duty fork-type latch with lock keeper and lock keeper guide and as indicated on the plans.

O. Fittings: All fittings to be hot-dip zinc coated shall be 1.2 ounces of zinc per square foot of coated area.

P. Concrete Post Footings: All concrete used shall conform to Section 03 30 00 – Cast-in-Place Concrete.

PART 3 - EXECUTION

3.03 INSTALLATION

A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed.

B. Setting Posts: Center and align posts in holes 6" above bottom of excavation. Space maximum 10' o.c. unless otherwise noted on the plans. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Extend concrete footings 2" above grade and trowel to a crown to shed water.

C. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

D. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

E. Bottom Tension Wire: Install tension wire within 6" of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced maximum 24" o.c.

F. Tension or Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to end, corner, pull and gate posts with tension bands spaced not over 15" o.c.

G. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
1. Maximum Spacing: Tie fabric to line posts 12" o.c. and to rails and braces 24" o.c.

H. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

I. Fabric: All fabric shall be placed on the inside of the baseball/softball fields, track, and tennis courts.

END OF SECTION

SECTION 32 31 32

COMPOSITE FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Composite fencing.

B. Related Sections:
   1. Section 03 30 00 - Cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. Provide composite fences as complete units controlled by a single source, including necessary erection accessories, fittings and fastenings.

1.3 WARRANTY

A. Provide 25-year limited warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide complete installation of Composite Fencing as manufactured by Veranda or Composite Fencing as manufactured by Trex Company, Inc.

B. Fasteners: Provide galvanized screws, brackets, and metal inserts of the sizes required.

C. Concrete: Provide a mix designed to produce concrete with a minimum 28-day compressive strength of 2,500 psi.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not begin installation and erection before final grading is completed.

B. Installation of fence shall be by skilled fence erector and on lines and grades indicated.

C. Drill post footing holes in undisturbed or compacted soil. Bottom of posts shall be set not less than 30" in concrete base.

D. Center posts and align in holes 2" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Extend concrete footings 2" above grade and trowel to a crown.

E. Securely attach composite rails and pickets with galvanized screws and brackets.

END OF SECTION

--- THIS PAGE INTENTIONALLY LEFT BLANK ---

SECTION 32 84 00

IRRIGATION

PART 1 GENERAL

1.01 GENERAL CONDITIONS

A. The requirements of the "General Conditions of the Contract" and of Division 1, "General Requirements", shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.02 SCOPE OF WORK

A. Provide all labor, materials, transportation, and services necessary to furnish and install Irrigation Systems as shown on the drawings and described herein.

B. Related work in other sections:
   1. Turf and Grasses

C. The term of "LICENSED IRRIGATOR" shall refer to Teague Nall and Perkins, Inc., 5237 N. Riverside Drive, Suite 100, Fort Worth, Texas 76137.

1.03 QUALITY ASSURANCE & REQUIREMENTS

A. Permits and Fees: The Contractor shall obtain and pay for any and all permits and all observations as required.

B. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications

C. Ordinances and Regulations: All local, municipal, and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and make a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. Explanation of Drawings:
   1. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
   2. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
   3. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Licensed Irrigator immediately. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

1.04 SUBMITTALS

A. Material List:
   1. The Contractor shall furnish the articles, equipment, or processes specified by name in the

drawings and specifications. No substitution will be allowed without prior written approval by the Licensed Irrigator.

2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number, and description of all materials and equipment to be used.
3. Equipment or materials installed or furnished without prior approval of the Licensed Irrigator may be subject to rejection, and the Contractor required to remove such materials from the site at his own expense.
4. Approval of any item, alternate, or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
5. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Record and As-Built Drawings:
1. The Contractor shall provide and keep an up-to-date and complete "as-built" record set of blue line ozalid prints which shall be corrected daily and show every change from the original drawings and specifications, the exact "as-built" locations, sizes, and kinds of equipment. Prints for these purposes may be obtained from the Licensed Irrigator at cost. This set of drawings shall be kept on the site and shall be used only as a record set.
2. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. These drawings shall be available at all times for inspection and shall be kept in a location designated by the Licensed Irrigator. Should the record blue line as-built progress sheets not be available for review or not up-to-date at the time of any inspection (refer to Section 3.09 - Observation Schedule), it will be assumed no work has been completed and the Contractor will be assessed the cost of that site visit at the current billing rate of the Licensed Irrigator. No other observations shall take place prior to payment of that assessment.
3. The Contractor shall make neat and legible notations on the as-built progress sheets daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, the Contractor must indicate that equipment has been relocated in a graphic manner so as to match the original symbols as indicated in the irrigation legend. The relocated equipment and dimensions will then be transferred to the original as-built plan at the proper time.
4. Hand drawn: In lieu of electronically drawn, before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to a sepia Mylar, or similar Mylar material, procured from the Licensed Irrigator. All work shall be in waterproof India ink and applied to the Mylar be a technical pen made expressly for use on Mylar material. Such pen shall be similar to those manufactured by Rapidograph, Kueffell & Esser, or Faber Castell. The dimensions shall be made so as to be easily readable, even on the final controller chart (see Section C). The original Mylar "as-built" plan shall be submitted to the Licensed Irrigator for approval prior to the making of the controller chart.
5. Electronically drawn: In lieu of hand drawn, before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to an AutoCAD electronic file procured from the Licensed Irrigator. All work shall be documented on a unique and separate layer. The electronically drawn "as-built" plan shall be submitted to the Licensed Irrigator for approval prior to the making of the controller chart.
6. The Contractor shall dimension from two (2) permanent points of reference - building corners, sidewalks, road intersections, etc. - the location of the following items:
   a. Connection to existing water lines
   b. Connection to existing electrical power
   c. Gate valves
   d. Routing of irrigation pressure lines (dimension maximum 100' along routing).
   e. Irrigation control valves.
   f. Routing of control wiring.
   g. Quick coupling valves.
   h. Road and sidewalk borings
   I. Other related equipment as directed by the Licensed Irrigator

7. On or before the date of the final inspection, the Contractor shall deliver the corrected and completed sepias to the Licensed Irrigator. Delivery of the sepias will not relieve the Contractor of the responsibility of furnishing required information that maybe omitted from the prints.

C. Controller Charts:
1. As-built drawings shall be approved by the Licensed Irrigator before controller charts are prepared.
2. Provide on (1) controller chart for each controller supplied.
3. The chart shall show the area controlled by the automatic controller and any area under a manual irrigation. The chart shall be the maximum size which the controller door will allow.
4. The chart is to be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing(s) is reduced, it shall be enlarged to a size that will be readable when reduced.
5. The chart shall be a black line print. A different color shall be used to indicate the area of coverage for each station.
6. When completed and approved, the chart will be hermetically sealed between two (2) pieces of plastic, each piece being a minimum 10 mils thickness.
7. These charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals:
1. Prepare and deliver to the Licensed Irrigator within ten (10) calendar days prior to completion of construction, two (2) hard cover binders with three (3) rings containing the followings information:
   a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative
   b. Catalog and parts sheets on every material and equipment installed under this contract.
   c. Guarantee statement.
   d. Complete operating and maintenance instructions on all major equipment, i.e. the automatic controller(s).
2. In addition to the above mentioned maintenance manuals, provide the Licensed Irrigator with instructions for major equipment and show evidence, in writing, to the Licensed Irrigator at the conclusion of the project that this service has been rendered.

E. Equipment to be Furnished:
1. Supply as a part of this Contract the following tools:
   a. Two (2) sets of special tools required for removing, disassembling and adjusting each type of irrigation head and valve supplied on this project.
   b. Two (2) four foot valve keys for operation of the ball and remote control valves.
   c. Two (2) keys for each automatic controller.
   d. One (1) quick coupler key and matching hose swivel ell for every five (5), or fraction thereof, of each type of quick coupling valve installed.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been damaged will be discarded and, if installed, shall be replaced with new piping.

1.06 SUBSTITUTIONS

A. If the Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the drawings and specifications, he may do so by providing the following information to the Licensed Irrigator for approval:
1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.

2. Provide descriptive catalog literature, performance charts, and flow charts for each item to be substituted.
3. Provide the amount of cost savings if the substituted item is approved.

B. The Licensed Irrigator shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to those equipment and materials listed on the irrigation drawings and specifications

1.07 GUARANTEE

A. The guarantee for the planting irrigation system shall be made in accordance with the attached form. The general conditions and supplementary conditions of these specifications shall be filed with the Owner and the Licensed Irrigator prior to acceptance of the irrigation system.

B. A copy of the guarantee form shall be included in the operations and maintenance manual.

C. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR PLANTING IRRIGATION SYSTEM

We hereby guarantee that the planting irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacement within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

_____

SIGNED: _____

COMPANY: _____

ADDRESS: _____

_____

_____

PHONE: (_____) _____ -- _____

DATE OF ACCEPTANCE: _____ / _____ / _____

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.

B. PVC pressure main line pipe and fittings:
   1. Pressure main line piping for sizes 3" and larger shall be PVC Class 200 with o-ring gasket joints.
   2. Pressure main line piping for sizes 2 1/2" and smaller shall be PVC Class 200 with solvent welded joints.
   3. Pipe shall be make from NSF approved Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipes must meet requirements as set forth in Federal Specification PS-22-70.
   4. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
   5. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
   6. All PVC pipe must bear the following markings:
      a. Manufacturer's name
      b. Nominal pipe size
      c. Schedule or class
      d. Pressure rating in P.S.I.
      e. NSF (National Sanitation Foundation) approval
      f. Date of extrusion
   7. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping:
   1. Non-pressure buried lateral line piping shall be PVC class 200 with solvent-weld joints.
   2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound to ASTM resin specification D1784. All pipes must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
   3. Except as noted in paragraphs 1 and 2 of Section 2.01B, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in Section 2.01B of these specifications.

D. Copper Piping and Fittings:
   1. Copper piping shall be type "K" hard-drawn with "sweat" type fittings.
   2. Pipe and fittings shall be assembled with 50/50 soft solder and non-erosive flux. Solder shall take up capillary action and joints shall be made tight without build-up head.
   3. Pipe ends shall be squared, reamed to remove burrs, and cleaned bright with fine sandpaper and steel wool.

E. Ball Valves:
   1. Ball valves shall be similar to those manufactured by Lasco, or approved equal, with threaded ends and equipped with a hand lever.
   2. All ball valves shall be installed per installation detail and the manufacturer's recommendations.

F. Gate Valves:
   1. Gate valves shall be manufactured out of bronze, pressure rated to 125 psi WSP, 200 psi WOG nonshock. Valves shall be resistant to rust and moderate atmospheric corrosion. Valves shall be the same size as the mainline. Valve shall have threaded IPS bonnet and non-rising stem, with female threaded inlets and equipped with a “Sure Grip” type handle. Similar to those manufactured by Watts Regulator Company Series GV, or approved equal.
   2. All gate valves shall be installed per the manufacturer's recommendations.

G. Quick Coupling Valves: Quick coupling valves shall have a brass two-piece body designed for working pressure of 150 p.s.i. operable with quick coupler. Key size and type shall be as shown on the plans.

H. Backflow Prevention Units:
   1. Backflow prevention units shall be of size and type indicated on the drawings. Install backflow prevention units in accordance with irrigation construction details.
   2. Wye strainers at backflow prevention units shall have a bronzed, screwed body with 60 mesh monel screen and shall be similar to Bailey #100B, or approved equal.

I. Automatic Drain Valves:
   1. Automatic drain valves shall be plunger type, duty virgin PVC construction, with small thread inlet.
   2. Drain valve shall be installed at an angle of 30 to 45 degrees horizontal, in a direction to facilitate pipe drainage.
   3. Provide sump pit for drainage.

J. Control Wiring:
   1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire, AWG-U.F. 600 volt.
   2. Pilot wires shall be a different color wire for each automatic controller.
   3. Common wires shall be white with a different color stripe for each automatic controller.
   4. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall the wire size be less than #14 gauge.
   5. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
   6. Where more than one (1) wire in placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
   7. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric remote control valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in the trench without stress or stretching of control wire conductors.
   8. All splices shall be made with Scotch-Lok #3576 Connector Sealing Packs, Rain Bird Snap-Tite wire connector, or approved equal. Use one (1) splice per connector sealing pack.
   9. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Licensed Irrigator. All approved field splices shall be placed in a Control Valve Box and labeled appropriately.

K. Automatic Controllers:
   1. Automatic controllers shall be of size and type shown on the plans.
   2. Final location of the automatic controller shall be furnished by others.
   3. Unless otherwise noted on the plans, the 120 volt electrical power to each automatic controller location shall be furnished by others. The final electrical hook-up shall be the responsibility of others.

L. Electrical Control Valves:
   1. All electric control valves shall be the same manufacture as the automatic controller.
   2. All electric control valves shall have a manual flow adjustment.
   3. Furnish and install one (1) control valve box for each electric control valve.

M. Control Valve Boxes:
   1. Use 10" round box for all field splices, Oldcastle Enclosure Solutions Model 910 with green cover, or approved equal. Extension sleeves shall be 6" PVC minimum size.
   2. Use 14" X 19" standard rectangular box for all gate valves and quick coupler valves, Oldcastle Enclosure Solutions Model 1419 with green, “Drop-N-Lock” lid cover, or approved equal. Extension sleeves shall be 6" PVC minimum size.
   3. Use 13" X 24" jumbo rectangular box for all electric control valves, Oldcastle Enclosure

Solutions Model 1324 with green, “Drop-N-Lock” lid cover, or approved equal. Extension sleeves shall be 6" PVC minimum size.

N. Irrigation Heads:
1. All irrigation heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the drawings, or specified in these special provisions.
2. Spray heads shall have a screw adjustment.
3. Riser units shall be fabricated in accordance with the details shown on the plans.
4. Riser nipples for all irrigation heads shall be the same size as the riser opening in the irrigation body.
5. All irrigation heads of the same type shall be of the same manufacture.

PART 3 EXECUTION

3.01 INSPECTION

A. Site Conditions:
1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive the Licensed Irrigator's approval prior to proceeding with work under this section.
2. Exercise extreme care in excavating and working near existing utilities. The Contractor shall be responsible for damages to utilities which are caused by his operations or neglect. Check existing utilities drawings for existing utility locations.
3. Coordinate installation of planting irrigation materials including pipe, so there shall be NO interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the planting irrigation system.

3.02 PREPARATION

A. Physical Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of irrigation heads.
2. All layout shall be approved by the Licensed Irrigator prior to installation.

B. Water Supply:
1. Planting irrigation system shall be connected to water supply points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on the drawings. The Contractor is responsible for minor changes caused by actual site conditions.
3. The point of connection shall be as shown on the drawings and shall be furnished by the Contractor, unless otherwise specified.

C. Electrical Supply:
1. Electrical connections for the automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations, as shown on the drawings. The Contractor is responsible for minor changes caused by actual site conditions.

3.03 INSTALLATION

A. Trenching:
1. All trenches shall be installed prior to topsoil application.
2. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on the drawings, and as noted.
3. Provide for a minimum of eighteen (18) inches cover for all pressure supply lines.

4. Provide for a minimum cover of twelve (12) inches for all non-pressure lines.
5. Provide for a minimum cover of eighteen (18) inches for all control wiring.

B. Backfilling:
1. Trenches shall be backfilled with sand (a layer of six [6] inches below the pipe and three [3] inches above the pipe) and compacted in layers to 95% standard proctor, using manual or mechanical tamping devices.
2. The trenches shall be backfilled a maximum of 50% with all joints exposed until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from clods of earth or stones larger than one-half (1/2) inch. Backfill shall be mechanically compacted landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.
3. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill.
4. Flooding of trenches will be permitted only with approval of the Licensed Irrigator.
5. If settlement occurs and subsequent adjustments in pipe, valves, irrigation heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:
1. Trenches located under areas where paving, asphaltic concrete or concrete, will be installed shall be backfilled with sand (a layer of six [6] inches below the pipe and three [3] inches above the pipe) and compacted in layers to 95% standard proctor, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm, unyielding condition. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, cap, and pressure test all piping under paving prior to the paving work.
2. Generally piping under existing walks is done by jacking, boring, or hydraulic driving, but where any cutting or breaking of sidewalks or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost, to the satisfaction of the Construction Manager. Permission to cut or break sidewalks or concrete shall be obtained from the Construction Manager. NO hydraulic driving will be permitted under concrete paving.
3. Provide for a minimum cover of eighteen (18) inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

D. Assemblies:
1. Routing of planting irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform to the details per plans.
2. Install NO multiple assemblies in plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with the respective detail. In the absence of detail drawings or specifications pertaining to specific items required to complete the work, perform such work in accordance with the best standard practice, with the approval of the Licensed Irrigator.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust, and moisture before the installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape, or approved equal, shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.

E. Line Clearance: All lines shall have a minimum clearance of six (6) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Automatic Controller: Install the automatic controller(s) in accordance with the manufacturer's

instructions. Remote control valves shall be connected to the controller in the numerical sequence as shown on the drawings.

G. High Voltage Wiring for Automatic Controller:
   1. 120 volt electrical service for the automatic controller shall be the responsibility of the Contractor. The Contractor shall be responsible for permitting and getting the electrical utility service company to install the appropriate electrical service and meter base necessary to operate each automatic controller. The final location of the electrical meter base shall be approved by the Licensed Irrigator.
   2. 120 volt electrical service connection to the automatic controller shall be provided by the Contractor.
   3. All electrical work shall conform to local codes, ordinances, and union authorities having jurisdiction.

H. Remote Control Valves: Install remote control valves where shown on the drawings and per the detail. When valves are grouped together, allow at least thirty-six (36) inches between valves. Install each remote control valve in a separate valve box. Each valve number (per the drawings) shall be stenciled on the valve box lid with exterior paint. Paint color shall be flat black. Stencil number size shall be 3" in height.

I. Gate Valves: Install gate valves where shown on the drawings. When valves are grouped together, allow at least thirty-six (36) inches between valves. Install each gate valve in a separate valve box. Each gate valve shall have stenciled on the valve box lid, "GV" with exterior paint. Paint color shall be flat black. Stencil letter size shall be 3" in height.

J. Ball Valves: Install ball valves where shown on the drawings and per the detail. When valves are grouped together, allow at least thirty-six (36) inches between valves. Install each ball valve in a separate valve box. Each ball valve shall have stenciled on the valve box lid, "BV" with exterior paint. Paint color shall be flat black. Stencil letter size shall be 3" in height.

K. Quick Coupler Valves: Install where shown on the drawings and per the detail. Install each quick coupler valve in a separate valve box. Each quick coupler valve shall have stenciled on the valve box lid, "QC" with exterior paint. Paint color shall be flat black. Stencil letter size shall be 3" in height.

L. Flushing of the System:
   1. After all new irrigation pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of the irrigation heads, the control valves shall be opened and full head of water used to flush out the system.
   2. Irrigation heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Licensed Irrigator.

M. Irrigation Heads:
   1. Install the irrigation heads as designated on the drawings. Irrigation heads to be installed in this work shall be equivalent in all respects to those itemized.
   2. Spacing of heads shall not exceed the maximum indicated on the drawings. In NO case shall the spacing exceed the maximum recommended by the manufacturer.

N. Field Splices: Install field splices of control valve wiring in a valve box (see Section 2.01 L.1). Each field splice valve box lid shall have stenciled "Field Splice" on it with exterior paint. Paint color shall be flat black. Stencil letter shall be 3" in height.

3.04 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.05 FIELD QUALITY CONTROL

A. Adjustment of the System:
   1. The Contractor shall flush and adjust all irrigation heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
   2. If it is determined by the Licensed Irrigator that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
   3. Lowering raised irrigation heads by the Contractor shall be accomplished within ten (10) calendar days after notification by the Licensed Irrigator.
   4. All irrigation heads shall be set perpendicular to finished grades unless otherwise designated on the drawings.

B. Testing of Irrigation System:
   1. The Contractor shall request the presence of the Licensed Irrigator, in writing, at least 24 hours in advance of the testing.
   2. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch, and prove watertight. Note that the testing of pressure main lines shall occur prior to installation of the electric remote control valves.
   3. All piping under paved areas shall be tested under hydrostatic pressured of 150 pounds per square inch, and proved watertight, prior to paving.
   4. Sustain pressure in lines for not less than four (4) hours. If leaks develop, replace joints and repeat the test until the entire system is proven watertight.
   5. All hydrostatic tests shall be made only in the presence of the Licensed Irrigator. NO pipe shall be completely backfilled until it has been inspected, tested, and approved in writing.
   6. Furnish necessary force pump and all other test equipment.
   7. When the planting irrigation system is completed, perform a coverage test in the presence of the Licensed Irrigator, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed, as indicated on the drawings, when it is obviously inadequate, without bringing this to the attention of the Licensed Irrigator. This test shall be accomplished before any ground cover is planted.
   8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

3.06 MAINTENANCE

A. The entire planting irrigation system shall be under full automatic operation for a period of seven (7) calendar days prior to any planting.
B. The Licensed Irrigator reserves the right to waive or shorten the operation period.

3.07 CLEAN-UP

Clean-up shall be made daily as each portion of the work progresses. Refuse and excess dirt shall be removed, all walks and paving shall be broomed or washed down, and any damage sustained on the work of others shall be repaired to the original condition.

3.08 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. The Contractor shall operate each system in its entirety for the Licensed Irrigator, at the time of the final observation. Any items deemed not acceptable by the Licensed Irrigator shall be re-worked to the complete satisfaction of the Licensed Irrigator.
B. The Contractor shall show evidence to the Licensed Irrigator that the Owner has received all accessories, charts, record drawings, and equipment as required before final inspection can occur.

3.09 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Licensed Irrigator, in advance, for the following observation meetings, according to the time indicated:
   1. Pre-Job Conference - 7 days.
   2. Pressure supply line installation & testing - 48 hours
   3. Automatic controller installation - 48 hours
   4. Control wire installation - 48 hours
   5. Lateral line and irrigation installation - 48 hours
   6. Coverage test - 48 hours
   7. Final inspection - 7 days

B. When observations have been conducted by other than the Licensed Irrigator, show evidence, in writing, of when and by whom these observations were made.

C. NO site observations will commence without as-built drawings. In the event the Contractor calls for a site visit without as-built drawings, without completing previously noted corrections, or without preparing the system for the said visit, he shall be responsible for reimbursing the Licensed Irrigator at his current billing rates per hour, portal to portal (plus transportation costs) for the inconvenience. NO further site visits will be scheduled until this charge has been paid and received.

END OF SECTION

SECTION 32 92 23

SODDING

PART 1 GENERAL

1.1 GENERAL CONDITIONS

The requirements of the "General Conditions of the Contract" shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.2 SCOPE OF WORK

A. Furnish all labor, material, equipment, and services necessary to provide all landscape sodding, and sprigging work, complete in place, as shown on the drawings and as specified.

B. Work specified in this Section: The work includes, but is not necessarily limited to:
1. Soil preparation
2. Fine grading
3. Sodding (Solid rolled Sod)
4. Clean-up
5. Maintenance

C. Related work in other Sections:
1. 32 93 00 TREES, SHRUBS, AND GROUNDCOVERS
2. 32 84 00 IRRIGATION
3. 32 92 13 HYDRO-MULCHING

D. Definition: The term of "Landscape Architect" shall refer to Teague Nall and Perkins, Inc., 5237 N. Riverside Drive, Suite 100, Fort Worth, Texas 76137.

E. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. American Society for Testing and Materials (ASTM): D 1557 Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 kg) Rammer and 18 in. (457mm) Drop.

1.3 SUBMITTALS

A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source that is to be used for turf areas:
1. Topsoil
2. Soil Amendments
3. Fertilizer: specifications and guaranteed analysis.
4. Biological Amendments: ingredients, chemical analysis, and manufacturer.
5. Sod certification documentation to include the following:
   a. Kind – Bermuda 419, Common Bermuda, St. Augustine, etc…
   b. Variety –Bermuda 419, etc.
   c. Lot Number – If applicable
   d. Record of square feet of sod shipped.
   e. Bill of Lading / Invoice # - This is an invoice number that can be referenced to the purchaser of the shipment.
   f. Field # - the field number references the harvested grass to the production field. The field number must be the same as on the certification application and field inspection report.
   g. Harvest Date – Record the date the grass was harvested.

h. Grower Name and Address- Record the production company name and address. Use of a stamp is acceptable if it shows on all copies.

B. Construction Schedule: At least two weeks prior to start of work, submit sodding schedule.

C. Maintenance: Submit three copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of the lawns for an entire year. Submit prior to Notice of Substantial Completion. See Section 3.10, 90 DAY MAINTENANCE

D. Chemicals: Submit products, rates of application, and anticipated uses of any pesticides, herbicides, and fumigants.

1.4 QUALITY ASSURANCE

A. Contractor's Qualifications
1. The work of this section shall be performed by a Contractor specializing in sodding or landscape installations.
2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last four years.

B. Lawn materials shall comply with all government regulations prevailing at the supply source and the job site.

C. Fertilizers; Mixed Commercial. Federal Specification: 0-F-241D

1.5 DELIVERY, STORAGE, AND HANDLING

A. Digging Sod
1. Do not dig sod at the nursery or other approved source until ready to transport sod to the project site or approved storage location.
2. Before stripping, sod shall be mowed at a uniform height of 2”.
3. Sod to be cut and delivered in rolled widths.
4. Cut sod to specified thickness and to standard width and length desired.

B. Transporting Sod
1. Sod transported to the Project in open vehicles shall be covered with tarps or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.
2. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.
3. Transporting sod in excess of 20 miles from the site shall be done during evening, night, early morning hours during summer months
4. Upon arrival at the temporary storage location or the site of the work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall remove it at once from the area of the work and replace it at no cost to Owner.
5. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of sod. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the Landscape Architect.
6. Certificate of Inspection when required must accompany each sod shipment.

C. Handling and Storage of Sod
1. No sod shall remain in temporary storage over 30 hours, and less time may be required during extremely high temperatures.

2. Sod shall be kept moist and shall be stored in a compact group to prevent drying out or freezing.
3. Contractor shall take extreme care in the handling of sod material to avoid breaking or tearing strips. Sod that has been damaged by poor handling may be rejected by the Landscape Architect.

1.6 JOB CONDITIONS

A. Do not install sod on saturated, excessively dry, or frozen soil.

B. Sod installation shall be subject to suitability of the weather and other conditions affecting sod growth.

C. Planting season may be extended only with the written permission of the Landscape Architect.

1.7 SAMPLES AND TESTS

A. The Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. The Contractor shall furnish samples upon request by the Landscape Architect. Rejected materials shall be immediately removed from the site at the Contractor's expense. Cost of the testing of materials not meeting specifications shall be paid by the Contractor.

B. After rough grading is complete, Contractor shall order and pay for a soil test which includes recommendations. Take a minimum of one soil test per 10 acres - or more as site conditions mandate. Take approximately 15 cores from each uniform soil area. Mix them thoroughly in a clean plastic or paper container. Fill the soil sample bag one-third to one-half full from this representative sample. Acceptable labs are:
1. TPS Lab: “SO-05, TPSL® Plant Natural™ Soil Test + LOI Organic Matter + Solvita®”
2. A&L Plains Agricultural Laboratories: “Basic Test S2” and “Basic Test S3” and “Organic Matter – by Combustion” (all three tests are required)

C. Submit results to Landscape Architect for adjustment to soil amendments and fertilizers.

1.8 MAINTENANCE

A. All stored plant material shall be maintained in a healthy, vigorous condition by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications. The storage area shall be mowed, weeded, and trimmed weekly during the course of construction and the life of the storage area.

B. Within the limits of construction, the site shall be maintained in a neat, well-kept appearance by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications.

C. Contractor shall maintain plant material as described in Part 3.6, 90-DAY MAINTENANCE

1.9 GUARANTEE AND REPLACEMENT

A. Warrant all lawns for a period of one year from date of Notice of Substantial Completion, to be at least the quality and conditions as at Final Acceptance. Promptly re-sod unacceptable areas during the warranty period as directed by the Landscape Architect.

B. Lawn shall be uniform in color, grass type, leaf texture, leaf and root density, and free from weeds, diseases, and other visible imperfections at acceptance.

C. Damage to the irrigation system by other trades or persons (such as shutting off of water or power to the irrigation system) shall not affect the warranty. This means that, especially in the warm season, the Contractor shall make daily visits to the site to inspect and repair the irrigation system up until final acceptance.

1.10 FINAL INSPECTION AND ACCEPTANCE

A. The Landscape Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Acceptance will be based on establishment of a uniform stand of turf grass, defined as coverage of specified grass at a density of 95 percent coverage, with no bare spots greater than one square foot, free of weeds, undesirable grass species, disease, and insects. For grass varieties selected, allow a minimum of 90 days for establishment and maintenance of an acceptable strand of grass.

C. In areas that are grassed and not irrigated. An acceptable strand of grass shall be established and the Landscape Architect will inspect the work for Substantial Completion upon written request of the Contractor.

D. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that the work of this Section be accepted.

PART 2 MATERIALS

2.1 SOLID SOD

A. Sod shall be as specified on plans, nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully and otherwise maintained from planting to harvest.

B. All sod shall be “Certified Sod” from a licensed and certified sod producer. Provide test results from a plant pathology lab to LA for approval before purchase.

C. For sports fields, or if called out on plans, use only rolled solid sod.

D. Thickness of Cut: Sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2” on width and plus or minus 5% on length. Broken strips and torn or uneven ends will be rejected.

E. Strength of Sod Strips: Sod strips shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.

F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively wet or dry) may adversely affect its survival.

G. Sod shall consist of live growing plants secured from sources which have dense, thickly matted root system throughout the soil of the sod for a minimum of one inch. Sod shall be free of weeds or other varieties of grasses.

H. Reject any Sod whose roots are dried because of sun or wind. The landscape architect has the right to reject any or all of sod due to lack of care, improper cutting, or other agronomic problems.

I. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 30-hour period unless a suitable preservation method is approved by the Landscape Architect prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation.

J. Thatch: Sod shall be relatively free of thatch. A maximum on 1/2" (uncompressed) thatch will be permitted.

K. Sod shall be free of diseases, harmful insects, nematodes, soil borne diseases, Nutsedge, and all other grassy and broadleaf weeds.

L. Fertilizer for Sod areas: "Holganix 7-9-5" or approved equal. Fertilizer shall be a complete fertilizer, water soluble, and shall consist of the following percentages by weight:
7% Nitrogen
9% Phosphoric Acid
5% Soluble Potash

2.2 TOPSOIL

A. All existing topsoil stripped for this work and suitable for reuse shall be stored on site as directed by the Landscape Architect. Dispose of all excess topsoil on the site as directed by the Landscape Architect.

B. Utilize on-site and imported topsoil to provide a minimum six inch (6") layer of approved soil for sod installation as specified and indicated on the Drawings.

C. If on-site topsoil is not available, imported topsoil shall be used as indicated on the drawings and as follows:
1. Imported Top Soil shall be natural, loose, fertile, friable, screened agricultural soil, having characteristics of representative productive soils in the vicinity, and obtained from naturally well-drained areas. Imported Soil for sod areas to be: "Enriched Top Soil", by Soil Building Systems, (972) 831-8181, or approved equal, submit a 1-quart package with supplier label attached to sample
2. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing the 2.0 millimeter sieve. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECe) of the saturation extract of this soil shall not exceed 3.0 millimhos per centimeter at 25 degrees centigrade. The boron content shall be no greater than 1 part per million as measured on the saturation extract. In order to insure conformance, samples of the import soil shall be submitted to the laboratory for analysis prior to, and following, backfilling.
3. Imported Top Soil shall be free of insects, harmful nematodes, soil-borne diseases, toxins, heavy clay, select fill, inorganic subsoils, heavy metals, trash, petroleum by-products, rocks over 1" diameter, rubble, roots, nutgrass, or weeds, or weed seeds.
4. Imported Topsoil shall have a pH between 6.5 - 7.3.

PART 3 EXECUTION

3.1 INSPECTION

A. Obtain written certification from the General Contractor that final grades to within 0.10' have been established prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. The Contractor shall be responsible for shaping all planting areas as indicated on the drawings, or as directed by the Landscape Architect.

B. Inspect site to insure that it is ready to be sodded and that irrigation system is working for all areas to receive sod.

3.2 EXCAVATION

A. Before placing any fill, remove, from the top six (6") inches of areas to be sodded, ALL:
   1. Stones, stumps, heavy clay, chemicals, paints or paint thinner, concrete, construction debris, inorganic select fill, rocks, limestone, or other deleterious matter one (1) inch in diameter or larger.
   2. Construction debris such as concrete, wire, plaster, brick, wood, paint, solvents, fuel, or similar substances that would be a hindrance to plant growth or maintenance.

B. After clean-up described above and establishment of subgrade, drag entire planting area with teeth of bucket to scarify subsoil to a depth of 4" to break up surface tension and allow water to pass downwards through the soil.

C. If soils are rocky or full of limestone or heavy clay, install irrigation system before adding topsoil so as to keep limestone or clay below imported topsoil and the root zone of plants.

D. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits, and planting beds.

E. Excess soil generated from the planting holes and not used as backfill or in the establishment of the final grades, shall be removed to an on-site location, as approved by the Owner. Unacceptable excess soil shall be removed to an appropriate off-site location.

F. Protect all areas from excessive compaction when trucking plants or other material to the planting site. Existing vegetation identified by the Landscape Architect to remain, shall be protected from trucking operations during the course of construction.

3.3 PRE-PLANT WEED CONTROL

A. After the irrigation system is operational and approved by the Landscape Architect, apply water for seven (7) to ten (10) calendar days, as needed to achieve weed germination.

B. If live perennial weeds exist on site at the beginning of the work, spray with a non-selective, systemic contact herbicide, as recommended and applied by an approved, licensed landscape pest control applicator. Leave sprayed plants intact for at least fourteen (14) days to allow systemic kill. Reapply at 2-week intervals until a complete kill is achieved.

C. Clear and remove these existing, dead weeds by mowing or grubbing off all plant parts at least 1" below the surface of the soil over the entire area to be planted.

D. Maintain the site weed-free until final acceptance by the Landscape Architect, utilizing mechanical and chemical treatment.

3.4 SOIL PREPARATION

A. Grade Preparation
   1. Immediately before sodding, power-rake, scarify, loosen, float and drag the upper 6" of topsoil to bring it to the proper condition. Remove foreign matter larger than 1/2" in diameter. Sod areas shall have topsoil that is smooth and compacted to 85% after preparation.
   2. If there is not sufficient existing approved topsoil on site, apply imported topsoil as specified in Section 2.1 G, MATERIALS, to achieve finish grade. If required, import topsoil to achieve depth of (6") of approved topsoil in all turf areas.
   3. Amendments: Apply pH Soil Doctor granular Humate at a rate of 500 lbs. per acre directly into slurry.

4. Fine Grading: After tillage and cleaning, all areas to be planted shall be leveled, fine graded, and drug with a weighted spike harrow or float drag. The required result shall be the elimination of ruts or depressions that would cause water to stand or pond immediately after rainfall or operation of the lawn irrigation system, humps, and objectionable soil clods. This shall be the final soil preparation step to be completed before the commencement of fertilizing and planting.
5. If the prepared grade is eroded or compacted by rainfall prior to fertilizing, rework the surface to specified condition.
6. Sod to be placed after final grade is approved in a timely manner not to exceed a 48-hour period from time of approval to laying of sod.

B. Spreading of Topsoil:
1. Topsoil and subgrade shall be damp when topsoil is spread. Top of subsoil shall be scarified and loose, not a hardpan before adding topsoil.
2. Areas to be sodded shall be top-soiled to a minimum depth of six in. (6”), compacted measure. Provide additional topsoil depths as required to construct the grades indicated on the Drawings. Topsoil shall be compacted to 85%, determined in accordance with ASTM: D 1557. Onsite topsoil is to be used unless it is not available, or is more than 25% clay, or is more than 10% limestone, or is rocky.

C. Fertilizing for Sod Areas:
1. NOTE: DO NOT FERTILIZE WILDFLOWERS OR NATIVE GRASSES. For sod areas uniformly distribute granular Sod Fertilizer (See Section 2.2 K) by mechanical means at the rate of 50 pounds per 10,000 square feet before laying sod. Till fertilizer (along with any amendment) into the top 1” of the turf area at a rate of (1) 50-lb bag per 10,000 SF (5 lbs. of fertilizer or .3 pounds of nitrogen per 1000 square feet) of area. Irrigate immediately following the application.
2. Work fertilizer into the soil to a depth of ½”-1” after fine grading & not more than 2 days prior to grass planting. Cultivating equipment shall be set so the fertilizer will not penetrate into the soil more than 1 inch. Do not apply fertilizer when there is a possibility of rain before lawn areas can be sodded.

3.5 SODDING

A. Weather Conditions
1. Schedule work for periods of favorable weather.
2. Do not place Sod on days that, in the judgment of the Landscape Architect, are too hot, sunny, dry, cold, wet, or windy for optimal growth.

B. Placement Pattern
1. The first row shall be laid in a straight line with subsequent rows parallel to the first row and tightly abutting each other.
2. Lateral joints shall be staggered. Care shall be exercised to insure that the sod is neither stretched nor overlapped. Joints must be butted tightly to prevent voids that could permit air to dry out roots.
3. Immediately after placing, sod shall be pressed firmly into contact with sod bed by tamping or rolling to eliminate air pockets.
4. When on slopes steeper than 4 to 1, sod shall be secured by galvanized pins, wood pegs or other methods approved by the Landscape Architect.
5. Sand joints and top dress turf with topdressing sand as necessary to provide a smooth uniform finished surface
6. Immediately after sodding operations have been completed, entire surface shall be compacted with a roller or other approved equipment. The completed area after sodding shall be uniformly even, firm, and true to finished grade lines.

C. Rolled Sod
1. For sports fields, or if called out on plans, use rolled solid sod.

2. Runs of rolled sod shall be maximized to minimize small pieces. Lay sod to avoid small or skinny pieces.
3. A bobcat and/or tractor with extra-wide tires and a “big roll” attachment shall be used to lay the rolls of sod.
4. Plastic netting shall be removed as sod is rolled out and properly disposed of upon installation as shown in the following photo:

D. Watering:
1. Provide an adequate supply of water to keep the sod thriving at the site prior to and during transplanting of the sod.

3.6 CLEAN-UP

A. After all planting operations have been completed, remove all trash, excess soil, empty plant containers, pallets, ties, rubbish, and all debris associated with this contract from the site. All scars, ruts, trench settlement, or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. The Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once a week, or the last working day of each week. All trash shall be removed completely from the site.

B. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition. All walks shall be left in a clean and safe condition.

C. Excess topsoil not required for lawns or planting shall be stockpiled on site for future use as directed by the Owner's representative.

D. Repair existing lawns damaged by operations under the contract. Repair shall include finish grading and sodding as required to match existing grade and lawn, and maintenance of repaired areas.

3.7 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits, according to the time indicated:
1. Pre-job Conference - 7 days
2. Final grade review - 2 days
3. Sod material review - 2 days
4. Soil Preparation and planting operations - 2 days
5. Pre-maintenance - 7 days
6. Final inspection - 7 days

B. When observations are conducted by someone other than the Landscape Architect, the Contractor shall show evidence, in writing, of when and by whom these observations were made.

C. NO site visits shall commence without all items noted in previous Observation Reports either completed or remedied unless such compliance has been waived by the Owner. Failure to accomplish punch list tasks or prepare adequately for desired inspections shall make the Contractor responsible for reimbursing the Landscape Architect at his current billing rates per hour, portal to portal (plus transportation costs) for the inconvenience. NO further inspections shall be scheduled until this charge has been paid and received.

3.8 GUARANTEE

A. All plant material shall be guaranteed by the contractor for a period of one (1) year from the date of final acceptance.

B. At the end of the guarantee period the Landscape Architect and Contractor shall inspect plant material. Any plant material under this contract that is dead or of an unsatisfactory growth condition shall be removed and replaced in a timely fashion by the contractor, at no cost to the owner.

3.9 ACCEPTANCE OF WORK

A. The contractor and Landscape Architect shall conduct an on-site inspection of all work and materials to determine compliance of work with the construction documents.

B. The contractor shall within reasonable means provide the Landscape Architect with sufficient data to demonstrate compliance with the construction documents.

C. The contractor shall be notified in writing of any non-conforming items, which are to be corrected (punch-list).

D. The contractor and Landscape Architect shall conduct an on-site inspection to verify completeness of punch list items.

E. Acceptance of work by the Owner shall begin upon verifying completion of punch list items and receipt of all deliverable items to Owner including letter of guarantee; release of liens waiver, record drawings denoting deviations from contract drawings, product data and maintenance guide.

F. The contractor shall receive written notification of date of final acceptance and ending date of required guarantee periods from the Landscape Architect.

3.10 90 DAY MAINTENANCE

A. The maintenance period shall commence when the Notice of Substantial Completion is issued and shall continue as required for a period of 90 days.

B. Immediately after sodding, the area shall be protected against traffic or other use by erecting barricades as needed, and by placing approved warning signs at appropriate intervals.

C. Contractor shall touch-up sod areas as required to achieve full coverage at no cost to Owner.

D. Mow turf grasses only (not wildflower or native grass areas) during establishment only for the purpose of weed control and to promote quicker spreading.
1. Mow Bermuda and Zoysia Grass to a 2” height.
2. Mow St Augustine Grass to a 4” height.

3. Mow at least once a week in the growing season once turf is rooted and growing.

E. Fill any depressions, settlement, or washouts that occurs within 90 days following installation. Re-sod bare spots that occur during the maintenance period as directed by the Landscape Architect at no cost to Owner.

F. Keep lawns clean and protected from damage during the maintenance period. Debris that accumulates shall be removed from the site. Promptly repair damaged lawns except as provided in Section 1.9, GUARANTEE AND REPLACEMENT.

G. Irrigate as required to supplement natural rainfall so that all lawn areas receive sufficient water for normal plant growth. Furnish all irrigation equipment needed for watering and be responsible for securing adequate supply of water if an automatic irrigation system does not exist, is not operating or is damaged.

H. A second fertilizer application shall be made 60 days after installation to turfgrasses. The specified fertilizer shall be a ratio of 15-5-10 applied at 800 pounds per acre.

END OF SECTION

SECTION 32 93 00

TREES, SHRUBS, AND GROUNDCOVERS

PART 1 GENERAL

1.1 GENERAL CONDITIONS

The requirements of the "General Conditions of the Contract" shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.2 SCOPE OF WORK

A. Furnish all labor, material, equipment, and services necessary to provide all landscape planting, complete in place, as shown on the drawings and as specified.

B. Work specified in this Section: The work includes, but is not necessarily limited to:
1. Soil preparation
2. Fine grading
3. Metal edging
4. Planting
5. Staking and Guying
6. Clean-up
7. Maintenance

C. Related work in other Sections:
1. 32 92 23 SODDING
2. 32 84 00 IRRIGATION

D. Definition: The term "Landscape Architect" shall refer to Teague Nall and Perkins, Inc. 5237 N. Riverside Drive, Suite 100, Fort Worth, Texas 76137.

1.3 SUBMITTALS

A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source that is to be used for Trees, Shrubs, and Groundcover areas: Plant type and nursery with clear pictures showing a measuring rod and person for scale.

B. Samples and product information: one-quart size sample in a quart-size baggie, list of ingredients, guaranteed chemical analysis, and manufacturer for:
1. Topsoil
2. Soil Amendments
3. Fertilizer
4. Weed Barrier (cut-sheet only)
5. Decomposed Granite
6. Mulch

C. Construction Schedule: At least two weeks prior to start of work, submit planting schedule.

D. Maintenance: Submit three copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of the landscape for an entire year. Submit prior to Notice of Substantial Completion.

E. Chemicals: Submit products, rates of application, and anticipated uses of any pesticides, herbicides, and fumigants.

1.4 QUALITY ASSURANCE

A. Qualifications
1. The Contractor shall be a company specializing in landscape installation.
2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last four years.

B. All materials and work shall comply with applicable sections of the following references:
1. American Association of Nurserymen, Inc., (AAN) Standard: American Standard for Nursery Stock (ANSI Z60.1, Most recent addition).
2. ANSI A 300 – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current edition and parts.
3. Florida Grades and Standards for Nursery Stock, current edition (Florida Department of Agriculture, Tallahassee FL).
4. Interpretation of plant names and descriptions shall reference the following documents. Where the names or plant descriptions disagree between the several documents, the most current document shall prevail.
   a. USDA - The Germplasm Resources Information Network (GRIN) http://www.ars-grin.gov/npgs/searchgrin.html
   b. Manual of Woody Landscape Plants; Michael Dirr; Stipes Publishing, Champaign, Illinois; Most Current Edition.
5. Pruning practices shall conform to recommendations “Structural Pruning: A Guide For The Green Industry” most current edition; published by Urban Tree Foundation, Visalia, California.
6. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign IL, most current edition.
7. Fertilizers; Mixed Commercial. Federal Specification: 0-F-241D

C. Source Quality Control:
1. Submit documentation to the Landscape Architect within ten (10) calendar days after award of the Contract that all plant material is available. The Contractor shall be responsible for all material listed on the plant list. Any substitutions due to unavailability must be requested, in writing, prior to confirmation of ordering. All material shall be subject to inspection by the Landscape Architect at any time after confirmation of ordering.
2. Plants shall be subject to inspection and approval of the Landscape Architect at the place of growth, or upon delivery for conformity to the specifications. Such approval shall not impair the right of inspection and/ or rejection during the progress of the work. Inspection and tagging of plant material by the Landscape Architect is for design intent only and does not constitute the Landscape Architect's approval of the plant materials in regards to their health and vigor as specified in Part 2, Section 2.1, H., Plant Material.
3. The health and vigor of the plant material is the sole responsibility of the Contractor. Submit written request for inspection of plant material at the place of growth to the Landscape Architect. Written requests shall state the place of growth and quantity of plants to be inspected. The Landscape Architect reserves the right to refuse inspection at this time if, in his judgment, a sufficient quantity of plants is not available for inspection.
4. The Contractor shall submit specifications of any item being used on site, upon the request of the Landscape Architect.
5. The Contractor shall obtain and pay for all permits required by local codes.
6. Ordinances and Regulations: All local, municipal, and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and make a part of these specifications, and their provisions shall be carried out

by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations, or requirements of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Deliver fertilizer to the site in the original, unopened containers bearing the manufacturer's guaranteed chemical analysis, name, trade mark, and conformance to State law.
2. The Contractor shall furnish the Landscape Architect with copies of receipts for all amendments specified in Section 2.1, Materials, or amended by the Soils Report specified in Section 3.2, Preparation.
3. Deliver all plants with legible identification labels.
   a. Label trees, bundles of containers of like shrubs, or groundcover plants.
   b. State the correct botanical plant name and size indicated on the plant list, on the drawings.
   c. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 calendar days.
4. Protect plant material during delivery to prevent damage to the root ball or desiccation of leaves.
5. Tarp trees and plant material with canvas, or similar material, during delivery of any length, on any open-air transport.
6. Transporting trees in excess of 20 miles from the site shall be done during evening, night, early morning hours during summer months. The Contractor shall routinely stop the transport and water root balls at pre-determined intervals. Intervals shall be in agreement with the Landscape Architect, as determined in advance of the transport.
7. The Contractor shall notify the Landscape Architect seven (7) calendar days in advance of delivery of all plant materials and shall submit an itemized list of the plants in each delivery.

B. Storage:
1. An on-site location shall be made available for plant material storage. Security and protection of the storage area shall be the Contractor's responsibility.
2. Store plant material in shade and protect from weather.
3. Maintain and protect plant material not to be planted within four (4) hours in a healthy, vigorous condition.
4. Storage of plant materials shall be neat, orderly, and grouped according to like plants.
5. Plant material, upon delivery, shall be inspected for transport damage, disease, and insect infestation. Any infected material shall be immediately removed from site at Contractor’s expense. Notify Landscape Architect in writing upon discovery of any pests.
6. The Contractor shall be responsible for completely restoring the storage area to the original condition prior to final acceptance of construction. Restoration shall occur within seven (7) calendar days of written notification by the Landscape Architect.

C. Handling: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of plant materials. Plant materials that have been damaged in any way will be discarded, and if installed, shall be replaced with undamaged materials at the Contractor's expense.

1.6 JOB CONDITIONS

A. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

B. Scheduling: Install trees, shrubs, and groundcover before hydraulic seeding or sodding operations are commenced.

1.7 SAMPLES AND TESTS

A. The Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. The Contractor shall furnish samples upon request by the Landscape Architect. Rejected materials shall be immediately removed from the site at the Contractor's expense. Cost of the testing of materials not meeting specifications shall be paid by the Contractor.

B. After rough grading is complete, Contractor shall order and pay for a soil test which includes recommendations. Take a minimum of one soil test per 10 acres - or more as site conditions mandate. Take approximately 15 cores from each uniform soil area. Mix them thoroughly in a clean plastic or paper container. Fill the soil sample bag one-third to one-half full from this representative sample. Acceptable labs are:
1. TPS Lab: “SO-05, TPSL® Plant Natural™ Soil Test + LOI Organic Matter + Solvita®”
2. A&L Plains Agricultural Laboratories: “Basic Test S2” and “Basic Test S3” and “Organic Matter – by Combustion” (all three tests are required)

C. Submit results to Landscape Architect for adjustment to soil amendments and fertilizers.

1.8 MAINTENANCE

A. All stored plant material shall be maintained in a healthy, vigorous condition by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications. The storage area shall be mowed, weeded, and trimmed weekly during the course of construction and the life of the storage area.

B. Within the limits of construction, the site shall be maintained in a neat, well-kept appearance by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications.

C. Contractor shall maintain plant material as described in Part 3.7, 90 DAY MAINTENANCE.

1.9 GUARANTEE AND REPLACEMENT

A. All materials (living and non-living) and workmanship shall be guaranteed for a period of one year after the Date of Acceptance by the Owner. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.

C. Contractor shall promptly replace all dead plants and all plants not in a vigorous, thriving condition, as determined by the Landscape Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period. Replacements shall match adjacent specimens of the same species. Replacements shall be subject to all the requirements stated in this Specification.

Contractor to make all necessary repairs due to plant replacements. Such repairs shall be done at no cost to the Owner.

D. The guarantee of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.

E. Damage to the irrigation system by other trades or persons (such as shutting off of water or power to the irrigation system) shall not affect the warranty. This means that, especially in the warm season, the Contractor shall make daily visits to the site to inspect and repair the irrigation system up until final acceptance.

F. Scheduling of replacements within a reasonable time shall be as determined by the Owner. In the event of failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, the Contractor authorizes the Owner to proceed to have said repairs or replacements made at Contractor's expense and Contractor agrees to reimburse Owner within 60 days.

1.10 FINAL INSPECTION AND ACCEPTANCE

A. At the end of the guarantee period, the Landscape Architect will, upon written notice of end of guarantee period inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Landscape Architect at that time, the Landscape Architect will recommend to the Owner that Final Acceptance of the Work of the Section be given.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The following specified soil amendments and fertilizer are to be used for bid prices basis only. Specific amendments and fertilizer specification will be made after rough grading operations are complete and soil samples are tested by the Laboratory at the Contractor's expense. See "Table of Soil Amendments, Fertilizer, and Mulch" on drawings for a summary.

B. All materials shall be of standard, approved, and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original, unopened container bearing the manufacturer's guaranteed analysis. The Contractor shall supply the Landscape Architect with a sample of all supplied materials accompanied by analytical compliance or bearing the manufacturer's guaranteed analysis.

C. Soil Amendment for Tree Planting: "Gumbo Buster", by Soil Building Systems, 972-831-8181, or approved equal. Till into existing soil to achieve a maximum ratio of 33% compost (1-part compost to 2-parts existing soil). See Submittals Section 1.3 B.

D. Soil Amendment for Shrub and Groundcover Planting: "Gumbo Buster", by Soil Building Systems, 972-831-8181, or approved equal. Till into existing soil to achieve a maximum ratio of 50% compost (1-part compost to 1-part existing soil). See Submittal Section 1.3 B.

E. Fertilizer for Tree, Shrub, and Groundcover Planting: Tree fertilizer shall be "Holganix 7-9-5" Granular, or approved equal. Tree fertilizer shall be water soluble, and shall consist of the following percentages by weight:

7% Nitrogen

9% Phosphoric Acid
5% Soluble Potash

F. Imported Top Soil:

1. Imported Top Soil shall be loose, fertile, friable, screened horticultural soil, having characteristics of representative productive soils in the vicinity, and obtained from naturally well-drained areas. Imported Soil for planting beds to be: “Ready-to-Plant”, by Soil Building Systems, (972) 831-8181, or approved equal. See Section 1.3 B.
2. Imported Top Soil shall be free of insects, harmful nematodes, soil-borne diseases, toxins, heavy clay, select fill, inorganic subsoils, heavy metals, trash, petroleum by-products, rocks over 1” diameter, rubble, roots, weeds, or weed seeds.
3. The pH of Imported Top Soil shall be between 6.5 and 7.3.
4. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing the 2.0 millimeter sieve. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECe) of the saturation extract of this soil shall not exceed 3.0 millimhos per centimeter at 25 degrees centigrade. The boron content shall be no greater than 1 part per million as measured on the saturation extract. In order to insure conformance, samples of the import soil shall be submitted to the laboratory for analysis prior to, and following, backfilling.

G. Plant Material:

1. Name and Variety: Provide plant materials true to name and variety described in Quality Assurance Section 1.4 B.
2. Plants shall be in accordance with the Texas State Department of Agriculture's Regulation for nursery inspections, rules, and ratings.
3. All plant material shall be No. 1 grade nursery stock or better, grown in accordance with good horticultural practice. Plants shall be free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. They shall be sound, healthy and vigorous, of uniform growth, typical of the species and variety, well formed, free from irregularities, with the minimum quality conforming to American Standard for Nursery Stock.
4. Plants indicated as specimen shall be exceptionally heavy, symmetrical, and tightly knit, cultured, to be unquestionably superior in form, branching, compactness, and symmetry.
5. The minimum acceptable sizes of all plants shall be measured before pruning and with branches in normal position. Unless otherwise designated on the plant list, all plant dimensions shall conform to those listed in ANSI Z60.1, American Standard for Nursery Stock.
6. Branching point is the distance above ground where balanced branching occurs or where a dimension in trunk appears to form the head of the tree.
7. Trees shall not have included bark in the crotches of the limbs. Trees with included bark shall be rejected.
8. Root Treatment: Root treatments on all plants shall conform to the requirements of ANSI Z60.1. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future development after planting.
9. Plants furnished in containers shall have the roots well established in the soil mass and shall have growth in the container for at least one growing season. Containers shall be large enough to provide earth root mass of adequate size to support the plant tops being grown.
10. Container-grown trees shall have a root ball measuring 10" of diameter for each 1" of tree caliper. The tree caliper shall be measured on the trunk, 6" above the finish grade or root flare of the tree. Plants, other than ground covers, over established in the container, as evidenced by pot bound root ends, will not be accepted.

11. B&B and Collected Plant Material (only permitted if specifically called out on plans) shall have a root ball measuring 12" of diameter for each 1" of tree caliper. The tree caliper shall be measured on the trunk, 6" above the finish grade or root flare of the tree.
12. If plants are specified as balled and burlapped (B&B), then B&B plants shall have a firm, natural ball of earth of sufficient diameter and depth to encompass the fibrous and feeding root systems necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord or a wire basket. Ball sizes shall meet the requirements of the ANSI Z60.1, or as indicated on the Drawings. B&B trees shall have been hardened off, meaning that they shall have been dug 6-52 weeks prior to shipment.
13. Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant
14. Plant materials are subject to final approval by the Landscape Architect at the job site.
15. All plants not conforming to the requirements herein specified, shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the work and replaced with new plants at the Contractor's expense. The plants shall be of the species, variety, size, and conditions specified herein or as shown on the drawings. Under no conditions will there be any substitutions of plants or sizes listed on the accompanying plans, except with the expressed, written consent of the Landscape Architect.

H. Plant Root Quality
1. Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:
   a. The roots shall be reasonably free of scrapes, broken or split wood.
   b. The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high quality root system are not considered injuries.
2. A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species. Plants with structural roots on only one side of the trunk (J roots) shall be rejected.
3. The root collar shall be within the upper 2 inches of the substrate/soil. Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.
4. The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.
5. At time of observations and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

I. Staking Materials:
1. Tree support stakes shall be Tree Frog Pro Series above ground guying system or approved equal. (352) 735-7411. Install according to manufacturer’s instructions.
2. Size according to:

a. Pro 20 – up to 2" caliper trees
b. Pro 40 – up to 4" caliper trees
c. Pro 60 – up to 6" caliper trees

3. Straps to be 3/4" wide, woven, green polypropylene, 900 lb. break strength, UV resistant strapping, provided by manufacturer.
4. Anchors to be arrowhead-shaped aluminum alloy (HD).

J. Tree Paint (for Oaks only to prevent spread of Oak Wilt): Tanglefoot Tree Wound Pruning Sealer (emulsified asphalt) or approved equal.

K. Weed Barrier: Weed Barrier product shall be "Weed Barrier Pro" as supplied by DeWitt Company 1-800-888-9669 or approved equal.

L. Water: Source furnished by the Contractor, cost and transport of water, as required, by the Contractor.

M. Mulch: "Fine Cut Hardwood Mulch" by Soil Building Systems, or approved equal - submit sample.

N. Sand: Sharp sand, clean of any debris.

O. Metal Edging: Sure-Loc Aluminum Edging, Anodized Black or approved equal. Edging shall be shop fabricated, 3/16 in. thick x 4 in. deep, primed and painted black. Edging shall be furnished in 16-20 ft. lengths with stakes. Sure-Loc Edging, 494 E 64th, Holland, MI 49243

PART 3 - EXECUTION

3.1 INSPECTION

A. Obtain written certification from the General Contractor that final grades to within 0.10' have been established prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. The Contractor shall be responsible for shaping all planting areas as indicated on the drawings, or as directed by the Landscape Architect.

B. Inspect trees, shrubs, and groundcover plant material for injury, insect infestation, and trees and shrubs for improper pruning.

C. Do NOT begin planting of plants until deficiencies are corrected.

3.2 EXCAVATION

A. Before placing any fill, remove, from the top twenty-four (24) inches of all areas to be planted (including tree pits in lawn areas), ALL:
1. Stones, stumps, heavy clay, chemicals, paints or paint thinner, concrete, construction debris, rocks, limestone, or other deleterious matter one (1) inch in diameter or larger.
2. Construction debris such as concrete, wire, plaster, brick, wood, paint, solvents, fuel, or similar substances that would be a hindrance to plant growth or maintenance.

B. After clean-up described above and establishment of subgrade, drag entire planting area with teeth of bucket to scarify subsoil to a depth of 4" to break up surface tension and allow water to pass downwards through the soil.

D. If soils are rocky or full of limestone or heavy clay, install irrigation system before adding topsoil so as to keep limestone or clay below imported topsoil and the root zone of plants.

E. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits, and planting beds.

F. Excess soil generated from the planting holes and not used as backfill or in the establishment of the final grades, shall be removed to an on-site location, as approved by the Owner. Unacceptable excess soil shall be removed to an appropriate off-site location.

G. Protect all areas from excessive compaction when trucking plants or other material to the planting site. Existing vegetation identified by the Landscape Architect to remain, shall be protected from trucking operations during the course of construction.

3.3 PRE-PLANT WEED CONTROL

A. After the irrigation system is operational and approved by the Landscape Architect, apply water for seven (7) to ten (10) calendar days, as needed to achieve weed germination.

B. If live perennial weeds exist on site at the beginning of the work, spray with a non-selective, systemic contact herbicide, as recommended and applied by an approved, licensed landscape pest control applicator. Leave sprayed plants intact for at least fourteen (14) days to allow systemic kill. Reapply at 2-week intervals until a complete kill is achieved.

C. Clear and remove these existing, dead weeds by mowing or grubbing off all plant parts at least 1" below the surface of the soil over the entire area to be planted.

D. Maintain the site weed-free until final acceptance by the Landscape Architect, utilizing mechanical and chemical treatment.

3.4 SOIL PREPARATION

A. Topsoil: If there is not sufficient existing approved topsoil on site, apply imported topsoil as specified in Section 2.1 G, MATERIALS, to achieve finish grade. If required import topsoil to achieve depth of 24” of approved topsoil in planting beds and tree pits.

B. Amendments: After finished grades have been established, soil shall be conditioned in the following manner:
1. For Tree Pits: (1) part soil amendment to (2) parts native or imported Topsoil.
2. For Shrub and Groundcover Beds: equal parts Soil Amendment and native or imported Topsoil. Amendments shall be uniformly spread and cultivated throughout the entire shrub and/or groundcover bed by means of a mechanical tiller. Till 6” of specified soil amendment 6” into native or imported topsoil to achieve 12” of planting media.

C. Fertilization:
1. Trees: Fertilize tree pits at time of planting. See Section 2.1 E, applying per manufacturer’s instructions. APPLY THE FERTILIZER IN THE PRESENCE OF THE LANDSCAPE ARCHITECT. Failure to apply the fertilizer in the presence of the Landscape Architect will result in the Contractor's responsibility to apply a second fertilization, at a time determined by the Landscape Architect, at no additional cost to the Owner. See Section 2.1 E, MATERIALS
2. Shrubs, groundcover, and seasonal color areas: Till fertilizer (along with amendment) into the top 6” of the planting bed at a rate of (1) 50-lb bag per 10,000 SF (5 lbs. of fertilizer or .3 pounds of nitrogen per 1000 square feet) of area. Irrigate immediately following the application. See Section 2.1 E, MATERIALS

D. Fine Grading: Contractor shall fine grade all areas for approval by LA. Contractor shall be responsible for providing 2% positive drainage in all planting areas. No planting or mulching will take place until all construction, clean-up, fine grading, and irrigation is complete in the immediate area. Final finish grading shall be reviewed by the LA before any planting takes place. Contractor shall be responsible for any additional topsoil required to create a smooth condition prior to planting.

E. All planting areas shall drain away from buildings by at least 2%.

3.5 PLANTING INSTALLATION

A. General:
1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Landscape Architect. Do not plant when raining or into waterlogged or frozen soil.
2. Only as many plants as can be planted, staked, and watered on that same day shall be distributed in a planting area.
3. Containers shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Lay-Out of Trees: Locations for Trees and bedlines shall be marked on the ground by the Contractor before any tree pits are dug. All such locations shall be approved by the Landscape Architect.
1. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for planting may be selected by the Landscape Architect. It shall by the Contractor's responsibility to confirm with the Owner, Landscape Architect, and all governing agencies, the location and depth of all underground utilities and obstructions.
2. Lay-out shall be accomplished with flagged grade stakes indicating tree names and specified plant size on each stake.

C. Container Removal: Cut the container on the sides with an acceptable can cutter. Do not injure the root ball. After removing the plant from the container, superficially cut the edges of roots with a sharp knife in three (3) equally spaced locations.

D. Ball & Burlap Removal: Cut off the top 6" of the wire basket. All wire on the root ball with less than a 4" x 4" grid pattern shall be removed entirely and disposed of at an off-site location. Remove all burlap, rope, twine, and wire from around the plant trunk. Lay any burlap back approximately 12", exposing a minimum of the top one-third (1/3) of the root ball. All material or fabric used as a substitution for burlap and is not equal to the degradable qualities of burlap, shall be removed entirely from the root ball and disposed of at an off-site location.

E. Box Container Removal: Remove the bottom of the plant boxes before planting. Place the plant in the pit, position, and backfill to a minimum of one-third the depth of the root ball. Remove the sides of the boxes without damaging the root ball.

F. Planting of Trees and Shrubs:
1. Planting pits shall be round, and sized in accordance with outlines and dimensions shown on the drawings.
2. All excavated tree holes shall have sloped sides (see detail) with roughened surfaces and shall be of a size that is two (2x) times the diameter of the root ball for all trees.

The depths of all excavated holes shall have a roughened pit bottom and shall be of a depth equal to the depth of the root ball or roots for all trees and shrubs.

3. If rotating augers or other mechanical diggers are Used to excavate holes, the vertical sides of the pits shall be scarified, fractured, or otherwise broken down to eliminate impervious surfaces.
4. Loosen or scarify the bottom of all plant pits to a depth of 4 inches.
5. SCARIFY ALL ROOTBALLS (#1 and larger) to prevent plants from remaining pot-bound. This is to be done by hand or with a 3-prong cultivator but never with a shovel or machete.
6. Center the plant in the pit or trench.
7. Place shrubs and groundcovers so that the top of the rootball is ¼" to ¾" above finish grade. Trees shall be set 1" above finish grade for each caliper inch of trunk. Example: A 3" tree shall be set 3" above finish grade. DO NOT, UNDER ANY CIRCUMSTANCE, PLANT TREES, SHRUBS OR GROUNDCOVER BELOW FINISH GRADE. DO NOT PLACE ANY SOIL ON TOP OF ROOTBALLS.
8. Set the plant plumb and hold rigidly in position until the soil has been tamped firmly around the root ball or roots.
9. After the plant has been placed, backfill shall be added to the hole to cover approximately one-half (1/2) the height of the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil. WATER IN AND COMPACT PLANTING BACKFILL TO PREVENT FORMATION OF AIR POCKETS.
10. Backfill the remainder of the hole after the water has percolated and is not standing in the hole. Construct a two inch (3") water saucer around the edge of the hole. The planting shall be immediately irrigated after planting until the entire area is saturated to the full depth of each hole. Install a two-inch (2") layer of the specified mulch on top of the root ball, and four (4") layer of mulch over the entire planting bed.

G. Staking and Guying:
1. Each tree shall be staked into undisturbed soil immediately following planting. Plants shall stand plumb after staking. See detail for staking guidelines. All stakes and guys shall be installed taught, equally spaced, and beyond the root ball. Refer to the detail on drawings.

H. Pruning:
1. Pruning shall be limited to the minimum necessary to remove injured twigs and branches. All limbs growing in a conflicting, crossing fashion with one another shall be pruned. Pruning may NOT be done prior to the delivery and acceptance of the plant material. PRUNING SHALL BE DONE ONLY IN THE PRESENCE OF THE LANDSCAPE ARCHITECT.
2. Do not use pruning paint except for Oak Trees. For Oaks, follow best practices by TexasOakWilt.org

    a. Clean all pruning tools with 10% bleach solution or Lysol between sites and/or trees.
    b. If possible, avoid pruning Oaks from Feb 1 - June 30.

I. Planting of Groundcovers and Seasonal Color:
1. Plants shall be grown in pots as indicated on the drawings. Plants shall remain in those pots until the time of transplanting into the designated areas. The pot's soil shall contain sufficient moisture so that it will not fall apart when lifting the plants from the pot.

2. Groundcover and seasonal color shall be planted in straight rows, evenly spaced, and at spacing called out on the drawings, unless otherwise noted on the drawings. Triangular spacing shall be used unless otherwise noted on the drawings.
3. Each rooted plant shall be planted with its proportionate amount of soil. Planting shall be immediately irrigated after planting until the entire area is saturated to the full depth of each hole.
4. Care shall be exercised at all times to protect the plants after installation. Any damage to the plants by trampling or other operations of this Contract shall be repaired immediately.
5. Seasonal color material and placement will be selected by the Landscape Architect at the time of installation.
6. The Owner and Landscape Architect reserves the right to review and approve all plant material at the nursery or grower.

J. Mulch Cover:
1. All trees, shrubs, groundcover, and seasonal color areas shall be top-dressed with a four inch (4") layer of mulch within 48 hours after planting. Install no more than 2 inches of mulch over the top of the root balls of all plants. See Section 2.1 M.

3.6 CLEAN-UP

A. After all planting operations have been completed, remove all trash, excess soil, empty plant containers, rubbish, and all debris associated with this Contract from the site. All scars, ruts, trench settlement, or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. The Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once a week, or the last working day of each week. All trash shall be removed completely from the site.

B. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition. All walks shall be left in a clean and safe condition.

3.7 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits, according to the time indicated:
1. Pre-job Conference - 7 days
2. Final grade review - 2 days
3. Plant material review - 2 days
4. Plant lay-out review - 2 days
5. Soil Preparation and planting operations - 2 days
6. Pre-maintenance - 7 days
7. Final inspection - 7 days

B. When observations are conducted by someone other than the Landscape Architect, the Contractor shall show evidence, in writing, of when and by whom these observations were made.

C. NO site visits shall commence without all items noted in previous Observation Reports either completed or remedied unless such compliance has been waived by the Owner. Failure to accomplish punch list tasks or prepare adequately for desired inspections shall make the Contractor responsible for reimbursing the Landscape Architect at his current billing rates per hour, portal to portal (plus transportation costs) for the inconvenience. NO further inspections shall be scheduled until this charge has been paid and received.

3.8 90 DAY MAINTENANCE

A. The maintenance period shall commence when the Notice of Substantial Completion is issued and shall continue as required for a period of 90 days.

B. Plants shall be inspected at least once per week by the Contractor during the installation period and needed maintenance performed promptly.

C. The Contractor shall irrigate all plants adequately to maintain optimum supply of moisture within the root zone; recurring overly dry or wet conditions shall be grounds for rejection of plant material. If the irrigation system is inoperative, hand watering shall be accomplished from a source approved by the Landscape Architect. Water shall not be applied with a force that will displace mulch or cause soil erosion and shall not be applied so quickly that it cannot be absorbed by the mulch and plants.

D. Plants shall be pruned and mulch shall be replaced as required.

E. Tree stakes and guys shall be adjusted or replaced as required. Repair eroded plant saucers.

F. Maintain all plant beds and tree saucers weed free at all times.

G. Keep plants free of insects and disease. All insecticides and fungicides applied to control pests and maintain plants in a healthy growing condition shall be approved by the Landscape Architect.

H. Fertilize plants at once during the warranty period. Fertilization shall be applied by topdressing 2 pounds per 100 square feet of bed area, and 3 to 5 pounds each tree. Fertilizer for the application shall be a controlled release type used for the installation.

I. Remove and replace, at no cost to Owner, dead and unacceptable plants as their condition becomes apparent.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the North Central Texas Council of Government (NCTCOG) Standard Specifications for Public Works Construction, City Specifications, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Work Included:
1. Installation of pipe material, fittings and concrete blocking.
2. Construction of fire hydrants, water meters, service lines, gate valves and detector checks.
3. Construction of improvements to City service stub.
4. Coordination with City work forces for extension of water improvements to serve this site.

B. Related Work Specified in Other Sections
1. Section 31 23 33 - Trenching and Backfilling
2. Section 31 00 00 - Earthwork

1.03 COORDINATION

A. Contractor shall coordinate installation of water system with other construction throughout the site.

B. All construction shall conform to NCTCOG and applicable City Standard Specifications for Construction.

C. All work of this Section shall be completed within the limits of the site property boundary or public right-of-way.

1.04 REFERENCES

A. AWWA C900: Requirements for PVC pressure pipe 4" thru 8" pipe
B. AWWA C110 or C907: Ductile Iron Fittings.
C. AWWA C502: Fire Hydrant Installation.
D. AWWA C500: Gate Valves
E. Texas Commission on Environmental Quality (TCEQ), Title 30 Texas Administrative Code (TAC), Chapter 290, “Public Drinking Water”.
Rule §290.38 Definitions
Rule §290.39 General Provisions
Rule §290.44 Water Distribution
Rule §317.13 Appendix E – Separation Distances
F. NSF International NSF/ANSI 61 Drinking Water System Components – Health Effects
G. National Fire Protection Association (NFPA) NFPA 24 Installation of Private Fire Service Mains and Their Appurtenances

1.05 SUBMITTALS

A. Submit manufacturer’s product data sheets to Engineer for review. All pipe, fittings and appurtenances not covered by this specification shall be approved by the engineer 7 days prior to bid.

B. Test Reports: Provide two (2) copies of each field quality control tests including, but not limited to hydrostatic tests, bacteriological tests, infiltration/exfiltration tests, mandrel tests, video camera test, flow test, etc.

C. Contractor is to accurately record installation of piping systems with appurtenances and present the information to Owner at the completion of the project as “Project Record Drawings”.

PART 2 - PRODUCTS

2.01 PIPE

A. Polyvinyl Chloride (PVC) water pipe and fittings with dimension control.

1. PVC Fireline Pipe, 4” through 12”: AWWA C900, Class 200, DR-14.

2.02 FIRE HYDRANTS

A. Manufacturer and style per City specifications and applicable sections of NCTCOG Item 502.3.

2.03 GATE VALVES

A. Manufacturer, type per City specifications and applicable sections of NCTCOG Item 502.6.

2.04 WATER METERS, DETECTOR CHECK

A. Manufacturer, type per City specifications and applicable sections of NCTCOG Item 502.10.

2.05 METER BOXES, VAULTS

A. Precast/cast-in-place per City specifications, plan details and applicable sections of NCTCOG Item 502.10.

PART 3 - EXECUTION

3.01 GENERAL

A. The locations of all structures and lines and grades of all pipes shall be staked by a registered surveyor. All facilities shall be located according to the site layout plans.

3.02 PIPES

A. All pipe shall be inspected prior to installation. Damaged pipes shall not be used. Replacement of damaged pipe shall be made by the Contractor at no expense to the owner.

B. Pipe installation shall conform to the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

A. Work Included:
1. Installation of pipe material.
2. Construction of drainage system structures including curb inlets, junction boxes and catch basins.
3. Ditch-out for storm drainage system discharge.

B. Related Work Specified in Other Sections
1. Section 31 23 33 - Trenching and Backfilling
2. Section 31 00 00 - Earthwork

1.03 COORDINATION

A. Contractor shall coordinate installation of drainage system with other construction throughout the site.

B. All construction shall conform to applicable City Specifications for Construction.

C. All work of this Section shall be completed within the limits of the site property boundary or designated offsite easements.

1.04 REFERENCES

A. ASTM C76: Specification for Reinforced Concrete Pipe.
B. AASHTO M294 HDPE Pipe
C. ASTM F477 HDPE Fittings

1.05 SUBMITTALS

A. All pipe and fittings not covered by this specification shall be approved by the engineer seven days prior to bid.

PART 2 - PRODUCTS

2.01 PIPE

A. Reinforced concrete pipe shall be Class III.

B. Plastic pipe shall be PVC SDR35 or Schedule 40 or HDPE heavy wall meeting the requirements of AASHTO M294 and ASTM F477 with corrugated exterior with smooth lined interior. All pipe joints shall be silt tight with all fittings watertight

C. ADS HP Storm polypropylene pipe (dual wall) meeting the requirements of AASHTO M330, ASTM F2736 and ASTM F2881 with smooth inner wall and annular exterior corrugations.

2.02 DRAINAGE STRUCTURES

A. Materials for the construction of inlets and junction boxes shall be as specified in Division 700, "Structures" of the NCTCOG's Standard Specifications for Construction.

PART 3 - EXECUTION

3.01 GENERAL

A. The locations of all structures and lines and grades of all pipes shall be staked by a registered surveyor. All facilities shall be located according to the site layout plans.

B. Contractor shall utilize necessary measures, including temporary pumping in order to drain storm water offsite until the public drainage improvements are installed and operational.

3.02 PIPES

A. All pipes shall be inspected prior to installation. Damaged pipes shall not be used. Replacement of damaged pipe shall be made by the Contractor at no expense to the owner.

B. Installation shall be in accordance with ASTM D2321 and as recommended by the pipe manufacturer. Backfill shall be ASTM D2321 Class I, II or III soils.

C. Pipe installation shall conform to the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction & City specifications.

D. Concrete collars shall be constructed where there is a change in pipe material

3.03 DRAINAGE STRUCTURES

A. Construction of curb inlets tops and catch basins in pavement areas shall be **cast-in-place only** with **no precast structures allowed**. All manholes in pavement areas shall be held below pavement and the frame/lid shall be adjusted to final grade with grade rings. There should be no abrupt grade changes at manholes rims. **If abrupt grade changes are present, grade adjustments will be required.** Catch basins and headwalls outside of pavement areas shall be either cast-in-place or precast.

B. Connections of pipe to structures shall be completely mortared around the perimeter of the pipe to ensure watertight connection to the structure prior to backfilling. All bends and tees shall be precast/preformed.

C. Inlet top and throat shall be poured once pavement improvements are in place.

END OF SECTION

VLK ARCHITECTS.COM