

PROJECT MANUAL



New Randall Hill Support Center

Midlothian Independent School District

Midlothian, Texas



MORE THAN ARCHITECTS

PROJECT MANUAL

Project Name: New Randall Hill Support Center

Client Name: Midlothian Independent School District

Location:

Midlothian, Texas

Project Number: 1776-06-01

Date:

May 28, 2020

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SECTION 00 0115
LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Following are the drawings which form a part of the contract, as set forth in subparagraph 1.1.1 of the accompanying "General Conditions of the Contract for Construction".

1.02 TITLE OF DRAWINGS:

AS1.1 ARCHITECTURAL SITE PLAN
AS1.2 DUMPSTER PLAN & DETAILS

STRUCTURAL

S0.0 GENERAL NOTES
S1.1 DEEP FOUNDATION ELEMENTS PLAN - SECTION 1
S1.2 FOUNDATION PLAN - SECTION 1
S2.1 TYPICAL FOUNDATION DETAILS
S2.2 TYPICAL FOUNDATION DETAILS
S3.1 ROOF FRAMING PLAN - SECTION 1
S4.1 TYPICAL FRAMING DETAILS

ARCHITECTURAL

 MASTER PLAN, DOOR SCHEDULE, CONFIGS AND DETAILS, FINISH
A1.1 SCHED
A5.1 EXTERIOR ELEVATIONS, WALL SECTIONS & DETAILS
A7.1 ROOF PLAN & DETAILS

MPE SITE

MPE1.0 SITE PLAN - MPE
MPE2.1 ROOF PLAN - MPE

MECHANICAL

M1.1 FLOOR PLAN - SECTION 1 - HVAC
M2.1 DETAILS, SCHEDULES & LEGEND -HVAC



PLUMBING

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P2.1	FLOOR PLAN - SECTION 1 - PLUMBING

ELECTRICAL

E0.0	ELECTRICAL LEGENDS, SCHEDULES, & NOTES
E1.1	FLOOR PLAN - SECTION 1 - LIGHTING
E2.1	FLOOR PLAN - SECTION 1 - POWER
E3.1	FLOOR PLAN - SECTION 1 - AUXILIARY SYSTEMS

TECHNOLOGY

ET1.1	ELECTRICAL COMMUNICATIONS FLOOR PLAN - SECTION 1
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END OF SECTION



SECTION 00 2116
INSTRUCTIONS TO PROPOSERS

INSTRUCTIONS TO PROPOSERS

1.01 RECEIPT AND OPENING OF PROPOSALS

- A. Competitive sealed proposals will be received from qualified Proposers by Mr. Matt Sanders, President, Board of Trustees, in care of Dr. Lane Ledbetter, Superintendent of Schools, Midlothian ISD, in the School Administration Building of the Midlothian ISD, Midlothian, Texas. The Proposal shall be submitted in two parts as follows: Part "A" and Part "B" of the Proposal shall be received until 2:00 PM, THURSDAY, JUNE 25, 2020. Upon submission of Part "A" of the Proposal, they will be publicly opened and read aloud for the furnishing of all labor, materials, and equipment, and performing all work required for New Randall Hill Support Center for Midlothian ISD, Midlothian, Texas, and in compliance with Project manual and drawings, and other contract documents as prepared by Huckabee.
- B. The School District will receive Part "B" of the Proposal and evaluate the submittal according to the selection criteria in order to determine which Proposal offers the best value to the District. The District will, within forty-five (45) days of the opening of Proposals, rank each of the Proposers using the Selection Criteria. Each Proposer will be notified of the rankings. If cost objectives cannot be reached with the top ranked offer, the District will move to the second ranked offer and other offers in turn until the cost objectives are met.
- C. Refer to Part 2 of this section for information regarding the proposal evaluation process and procedures.
- D. **THERE WILL BE A PRE-PROPOSAL MEETING HELD AT 1:00 PM, TUESDAY, JUNE 9, 2020 AT LAURA JENKINS DEVELOPMENT CENTER; 315 E Ave East, Midlothian, TX 76065. ATTENDANCE IS HIGHLY RECOMMENDED.**

1.02 PREPARATION OF PROPOSAL

- A. The Proposer shall submit a competitive sealed proposal for the General Construction of the project as bound in the project manual, Section 00 4200 Part A and Section 00 4335 Part B. A proposal will be considered incomplete unless both Parts A and B of the Proposal are submitted. The Proposer's competitive sealed Proposal shall include all of the following items:
 - 1. Part "A" submission:
 - a. Proposal Section 00 4200, Part A.
 - b. Cashier's Check, Certified Check, or Bid Bond for no less than 5% of the largest possible total for the proposal submitted.
 - 2. Part "B" submission:
 - a. Proposal Section 00 4335 Part "B"
- B. A Cashier's Check, Certified Check, or acceptable Bidder's Bond payable to the Midlothian ISD, in the amount of not less than 5% of the largest possible total for the proposal submitted, must accompany each proposal in Part "A" of the Proposal submission.
- C. The successful Proposer will be required to enter into a contract with the Midlothian ISD and to furnish a Performance and Payment Bond of approved form through an approved bonding company duly authorized to do business in the State of Texas, and currently listed in the Department of Treasury Federal Register, in the amount of not less than 100% of the contract price, conditioned upon the performance of the contract. Performance and Payment Bonds shall be in full compliance with Texas Government Code Chapter 2253. AIA Bonds (AIA Document A312) do not comply. Bonding Companies using "Reinsuring Insurance Companies" to expand the Bonding Companies Bonding Limits will not be acceptable unless also approved by the Owner.

1.03 WAGE RATES

- A. 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 and listed in

Section 00 7343 - Wage Rate Requirements

1.04 DISCLOSURE OF INTERESTED PARTIES

- A. In accordance with LGC 2252.908, the awarded Vendor is required to submit to the Texas Ethics Commission a fully executed Form 1295 electronically. The Texas Ethics Commission WILL NOT accept a paper submittal. Upon submittal of that form to the Texas Ethics Commission, the awarded Vendor MUST forward a copy of the submitted form to the Director of Purchasing. The District must then go to the Texas Ethics Commission and acknowledge that you have submitted Form 1295. NO CONTRACT CAN/WILL BE SIGNED OR EXECUTED UNTIL THIS PROCESS HAS BEEN COMPLETED.
- B. Contractor shall file online at the following location:
https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

1.05 PROPOSAL GUIDELINES

- A. Attention is called to the fact that the Owner is exempt from the payment of the State Sales Tax normally levied against material costs. The contract sum, as identified by the Proposal, shall not include any allowance for the payment of State Sales Tax on materials required to complete the work. The successful Proposer, upon award of the contract, will be furnished with a permit number, which will enable him to purchase the required materials without payment of such taxes.
- B. The Project Manual and Drawings may be examined, without charge, in the Architect's office and Electronic Documents (PDF Files) may be downloaded at www.huckabee-inc.com.
- C. The Architect will supply Project Manual and Drawings to various plan rooms where it appears to be in the Owner's interest to do so.
- D. All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, and the Supplementary General Conditions included in the Project Manual are applicable to the Instructions to Proposers.
- E. Contract Documents include the Advertisement or Invitation for Proposal, Instructions to Proposers, the Proposal Form, and the proposed contract documents (drawings and project manual), including any addenda issued prior to receipt of competitive sealed proposals.
- F. Addenda are written or graphic instruments issued prior to the execution of the contract which modify or interpret the proposal documents, including drawings and project manual, by additions, deletions, clarifications or corrections and should be acknowledged by the Proposer on the Proposal form. Addenda will become part of the contract documents when the construction contract is executed. ADDENDA WILL BE PUBLISHED ON THE WEBSITE OF HUCKABEE (www.huckabee-inc.com). NO ADDENDA WILL BE MAILED OR FAXED TO ANY PLANHOLDER.
- G. Each Proposer, by making a competitive sealed proposal, represents that he has carefully studied, compared, and understands the contract documents including any and all addenda items.
- H. Each Proposer, by making a competitive sealed proposal, represents that he has familiarized himself with and understands the local conditions under which work is to be performed, including prevailing subsurface conditions.
- I. All competitive sealed proposals must be prepared on the form provided by the Architects and submitted with all other required material in accordance with the Instructions to Proposers. When the proposal contains multiple "Bid Items", it shall be understood that the Owner may award each Proposal Item separately, or in any combination that the Owner chooses.
- J. A proposal is invalid if it has not been deposited at the designated location prior to the time and date for receipt of proposals indicated in the Advertisement or Invitation for Proposal or prior to any extension thereof issued to the Proposers.

- K. Unless otherwise provided in any supplement to the Instruction to Proposers, no Proposer shall modify, withdraw or cancel his proposal or any part thereof for forty-five days after the time designated for the receipt of proposals in the Advertisement or Invitation for Proposal.
- L. Each Proposer represents that his competitive sealed proposal is based upon the material and equipment described in the contract documents.
- M. Each Proposer shall carefully study and compare the proposal documents, and not later than seven (7) days prior to the date for receipt of competitive sealed proposals, shall make written request to the Architect for interpretation or correction of any ambiguity, inconsistency or error therein which he may discover. Any interpretation or correction will be issued in a written addendum by the Architects. Only a written interpretation or correction by an addendum shall be binding. No Proposer shall rely upon any interpretation or correction given by any other method.
- N. No substitution will be considered unless written request has been submitted to the Architect for approval at least ten (10) days prior to the date for receipt of proposals. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.
- O. If the Architect approves any proposed substitution, such approval will be set forth in an Addendum.
- P. Should the particular equipment, which any bidder proposes to install, require other space conditions other than those shown on the drawings, he shall arrange for such space with the Architect before submitting a bid. Should changes become necessary because of failure to comply with this requirement, the contractor shall be fully responsible for making such changes. The contractor shall be required to submit working drawings of all equipment, which varies from the drawings and the project manual, and any interference must be eliminated before work proceeds.
- Q. The Proposer acknowledges the right of the Owner to reject any or all proposals and to waive any informality or irregularity in any proposal received. In addition, the Proposer recognizes the right of the Owner to reject a proposal if the Proposer failed to furnish any required bid security or to submit the data required by the contract documents, or if the proposal is in any way incomplete or irregular.
- R. By submitting a proposal, each proposer agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any proposal; waiver of any requirements under the Bid Documents; or the Contract Documents; acceptance or rejection of any proposals; and award of the Contract.
- S. In case of ambiguity or lack of clearness in stating the price in the Proposal, the Owner reserves the right to adopt the price written in words or to reject the Proposal.

1.06 GUARANTEES

- A. Besides guarantees required elsewhere, contractor shall guarantee the work in general for one year. Contractors shall be held responsible for and must make good any defects arising or discovered in any part of his work within one year period noted on the form, and in certain other parts as required by the project manual for a long period. Where detailed specifications call for guarantees as above specified, they shall cover the special features called for.
- B. In addition to guarantees called for elsewhere in the project manual, the contractor shall guarantee all of his work for a period of one year after the date of substantial completion against defective material or faulty workmanship that may arise within that period.
- C. All guarantees must be submitted to the Architect before the final payment request will be approved.

- D. All guarantees must be submitted to the Architect in the following form as prerequisite to acceptance for payment.

GUARANTEE FOR _____

We hereby guarantee the _____

which we have installed in the _____

at _____

for _____(_____)years from the date of full completion and acceptance by the Owner.

We agree to repair or replace to the satisfaction of the Architect, and at no expense to the Owner, any or all work that may prove defective in workmanship or materials, or is not meeting the specification requirements within that period (ordinary wear and tear and unusual abuse or neglect excepted) together with any other work which may be damaged or displaced in so doing.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified in writing, we, collectively and separately, do hereby authorize the Owner to proceed to have the defects repaired and made good at our expense, and will pay the costs and charges therefore immediately upon demand.

Signature of Subcontractor _____

Date _____

Signature of Contractor _____

1.07 CERTIFICATION OF PROJECT COMPLIANCE

CERTIFICATION OF PROJECT COMPLIANCE	Completion of this form is required under provisions of 61.1036(c)(3)(F) TAC for all public school district construction projects.
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1. PROJECT INFORMATION DISTRICT:

Facility: ARCHITECT/ENGINEER:

Address: CONTRACTOR/CM:

City: CONTRACT DATE:

DATE DISTRICT AUTHORIZED PROJECT:

BRIEF DESCRIPTION OF PROJECT:

2. CERTIFICATION OF DESIGN AND CONSTRUCTION

The intent of this document is to assure that the school district has provided to the architect/engineer the required information and the architect/engineer has reviewed the School Facilities Standards as required by the State of Texas, and used his/her reasonable professional judgment and care in the architectural/engineering design and that the contractor has constructed the project in a quality manner in general conformance with the design requirements and that the school district certifies to project completion.

3. The District certifies that the educational program and educational specifications of this facility along with the identified building code to be used have been provided to the architect/engineer.

DISTRICT: **BY:** **DATE:**

4. The Architect/Engineer certifies the above information was received from the school district, and that the building(s) were designed in accordance with the applicable building codes. Further, the facility has been designed to meet or exceed the design criteria relating to space (minimum square footage), educational adequacy, and construction quality as contained in the School Facilities Standards as adopted by the Commissioner of Education, July 9, 2003, and as provided by the district.

ARCHITECT/ENGINEER: **BY:** **DATE:**

5. The Contractor certifies that this project has been constructed in general conformance with the construction documents as prepared by the architect/engineer listed above.

CONTRACTOR/CM: **BY:** **DATE:**

6. The District certifies completion of the project (as defined by the architect/engineer and contractor).

DISTRICT: **BY:** **DATE:**

PROPOSAL EVALUATION PROCESS AND PROCEDURES

2.01 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.

2.02 PROPOSAL EVALUATION COMMITTEE

- A. For each construction project utilizing the Competitive Sealed Proposal method of procurement, the School Board shall convene a Proposal Evaluation Committee (Committee) may be comprised from of the following individuals:
1. School Board Members
 2. School Administration
 3. District's Financial Officer or Consultant
 4. Staff
 5. Project Architect
 6. Project Engineer
 7. Program Manager

2.03 PROPOSAL EVALUATION COMMITTEE FUNCTION

- A. 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:
1. 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.
 2. The Committee shall conduct thorough discussions and evaluations of all Proposals.
 3. 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.
 4. 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	6.00
TAB 3 – Key Project Personnel	10.00
TAB 4 - Subcontractors	10.00
TAB 5 – Project Experience	10.00
TAB 6 - Financial Background	5.00
TAB 7 - Claims and Suits	2.00
TAB 8 - Quality Control Program	2.00
TOTAL OF WEIGHTED VALUE	100.00

B.

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.

C. 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.

D. 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. (Refer to Item 2.3.B.1) 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.

E. 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.

2.04 COMPETITIVE SEALED PROPOSALS PREPARATION AND SUBMISSION

A. PREPARATION

1. The Proposal shall be based on conditions at the project site, the project Drawings and Specifications and any addenda issued.
2. A Proposal showing omissions, alterations, conditions, or carrying riders or other qualifiers, which modifies the Proposal, may at the Owner's discretion, be rejected as irregular.
3. The various sections of the Proposal data should be separated by tabbed dividers. The tabs must identify the sections by number and name rather than simply a number or alphabet.

B.

SUBMISSION

1. If the Proposer chooses to issue a "No Response" (N/R) to a question on the Proposal, an explanation of this action is required. Failure to provide an adequate explanation may be viewed by the Owner as an incomplete response and may subject the entire Proposal to rejection or at a minimum a score of zero (0) will be given for that category.

2. Only one Proposal may be submitted by each Proposer. If two or more Proposals are submitted, either in one envelope or in separate envelopes, such multiple Proposals may be subject to rejection.
3. Proposals received after the advertised time for the Proposal opening will be ineligible and will be returned unopened.
4. After all Proposals are opened, but before the names of the Proposers and the monetary Proposals are read aloud, they will be examined by the presiding official to determine if they are complete, in proper form and properly signed. If an error or omission is discovered and classified by the presiding official as a technicality, which the Owner has reserved the right to waive, the Proposer's representative may be permitted to make the appropriate correction. Any such correction will be announced and explained to the others present at the Proposal opening. A Proposal that is not and cannot be made eligible for consideration under this procedure will not be read, nor will the Proposal prices be revealed publicly.
5. A Proposer will receive no compensation or reimbursement of expenses incurred in the preparation of a Competitive Sealed Proposal submission.
6. The Owner reserves the right to reject any or all Proposals, and waive any and/or all formalities.

2.05 PUBLIC INFORMATION AND NOTICE OF CONFIDENTIALITY

- A. The Owner considers all Proposal information, documentation and supporting materials submitted in response to this Proposal request to be non-confidential and/or non-proprietary in nature, and therefore, shall be subject to the public disclosure under the Texas Public Information Act (Texas Government Code, Sec. 552.001, et seq.) after the award of the contract.
- B. The Proposer must identify and designate those portions of their technical Proposal that contains trade secrets or other proprietary data. If the Proposal includes such data, the Proposer shall:
 1. Mark the cover sheet of the Technical Proposal with the following phrase: "This Proposal includes data that shall not be disclosed outside the School District and the A/E design team and shall not be duplicated, used or disclosed in whole or in part for any purpose other than to evaluate the Proposal."
 2. Mark each sheet and the specific data on that sheet that the Proposer wishes to restrict with the following phrase: "Use or disclosure of the specifically marked data is subject to the restrictions regarding confidentiality cited on the cover sheet of this Proposal."

2.06 OWNERSHIP OF COMPETITIVE SEALED PROPOSAL

- A. Submitted Proposals, documentation and supporting material shall become the property of the Owner.
- B. After award or rejection action by the Owner, the Proposer's financial statement and other information that has been properly identified and marked in accordance with Paragraph 2.5 of these Instructions for Competitive Sealed Proposals, entitled "Public Information and Notice of Confidentiality," will be returned to the Proposer as expeditiously as possible.

2.07 SITE INVESTIGATION

- A. It is the responsibility of each Proposer to examine the project site, existing improvements and adjacent property and be familiar with existing conditions before submission of Proposal.
- B. After investigating the project site and comparing the Project Manual and Drawings with the existing conditions, the Proposer should immediately notify the A/E of any conditions for which requirements are not clear, or about which there is any question regarding the extent of the work involved.
- C. Should the successful Proposer fail to make the required investigation and should a question arise after award of the contract as to the extent of the work involved in any particular case,

after receiving recommendations from the A/E, the Owner will make the interpretation of the Contract Documents.

2.08 EVALUATION AND CONTRACT AWARD PROCESS

- A. Proposals will be opened publicly to identify the names of the Proposer and their respective proposed contract amount. Other contents of the Proposals will be afforded security sufficient to preclude disclosure of the contents prior to award or rejection action.
- B. Once the Proposal Part B has been submitted, the Owner may opt to interview each Proposer prior to the actual evaluation of the Proposals.
- C. Proposals will be evaluated by the Proposal Evaluation Committee as set forth in 2.2.A. The criteria for evaluation and selection of the successful Proposer for this award will include the factors listed in 2.3.A.4.
- D. Within forty-five (45) calendar days after opening the Proposals, the Owner will evaluate and rank each Proposal with respect to the published selection criteria described under Paragraph 2.3. After opening and ranking, an award may be made on the basis of the initially submitted Proposal, without discussion, clarification or modification, or the Owner may discuss with the selected Proposer any element of the Proposal. Other than the data read at the Proposal opening, the Owner shall not disclose any information derived from the Proposals submitted by competing firms in conducting such discussions. If the Owner determines that it is unable to reach a satisfactory agreement with the first ranked Proposer, the Owner will terminate discussions with that Proposer. The Owner will then proceed with negotiations with each successive Proposer as they appear in the order of ranking until an agreement is reached, or until the Owner has rejected all Proposals. After termination of discussions with any Proposer, Owner will not resume discussions with that Proposer.
- E. Immediately following the Owner's approval of the order of ranking of Proposers and the Owner's contract award or Proposal rejection action, the Proposers will be notified via U.S. mail and/or facsimile message.
- F. The Owner reserves the right to accept or reject any or all alternates or to accept any combination of alternates considered advantageous to the Owner.
- G. The award or rejection action regarding this Proposal is at the sole discretion of the Owner and the Owner makes no warranty regarding this Proposal that a contract will be awarded to any Proposer.
- H. The Owner agrees that if the Contract is awarded, it will be awarded to the Proposer offering the best value to the Owner, based upon the published selection criteria, and upon its ranking evaluation. The Owner is not bound to accept the lowest priced Proposal if that Proposal is judged not to be the best value for the Owner, as determined by the Owner.

END OF SECTION

**SECTION 00 3132
GEOTECHNICAL DATA**

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

1.02 INVESTIGATION

- A. An investigation of subsurface soil conditions at the building site was authorized by the Owner, and these investigations were made by CMJ Engineering, Inc., report number 912-19-14, dated August 21, 2019.

1.03 REPORT

- A. The complete report of the testing laboratory follows this section and is provided for information only.
- B. Report and log of borings are available for Contractor's information but is not a warranty of subsurface conditions, nor is it a part of the Contract Documents.

1.04 RESPONSIBILITY

- A. Bidders are expected to examine the site and subsurface investigation reports and then decide for themselves the character of the materials to be encountered.
- B. The Owner and Architect assume no responsibility for variations of subsoil quality or conditions.
- C. The Owner and the Architect assume no responsibility for any conclusions or interpretations made on the basis of subsurface information contained in the contract documents.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

**GEOTECHNICAL ENGINEERING STUDY
PROPOSED METAL BUILDING
LAURA JENKINS DEVELOPMENT CENTER
MIDLOTHIAN, TEXAS**

Presented To:

Midlothian Independent School District

August 2019

PROJECT NO. 912-19-14

August 21, 2019
Report No. 912-19-14

Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065

Attn: Ms. Rola Fadel
Director of Architecture and Facilities

**GEOTECHNICAL ENGINEERING STUDY
PROPOSED METAL BUILDING
LAURA JENKINS DEVELOPMENT CENTER
MIDLOTHIAN, TEXAS**

Dear Ms. Fadel:

Submitted here are the results of a geotechnical engineering study for the referenced project. The geotechnical services were performed in accordance with CMJ Estimate No. 19-7306 dated May 18, 2019. The geotechnical services were authorized via Midlothian ISD Purchase Order No. 9092000021.


Engineering analyses and recommendations are contained in the text section of the report. Results of our field and laboratory services are included in the appendix of the report. We would appreciate the opportunity to be considered for providing the materials engineering and geotechnical observation services during the construction phase of this project.

We appreciate the opportunity to be of service. Please contact us if you have any questions or if we may be of further service at this time.

Respectfully submitted,
CMJ ENGINEERING, INC.
TEXAS FIRM REGISTRATION NO. F-9177



Matthew W. Kammerdiener, P.E.
Project Engineer
Texas No. 127818



James P. Sappington IV, P.E.
President
Texas No. 97402

copies submitted: (2) Ms. Rola Fadel; Midlothian ISD (mail and email)

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APPENDIX A

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1.0 INTRODUCTION

1.1 General

The project site is located at the existing Laura Jenkins Development Center at 315 E. Avenue East in Midlothian, Texas. The project, as currently planned, will consist of a single-story metal building with a footprint of 4,655 square feet. Structural loads are anticipated to be relatively light and no basements are planned. Area paving and drives are also planned. The approximate locations of the exploration borings are depicted on Plate A.1, Plan of Borings.

1.2 Purpose and Scope

The purpose of this geotechnical engineering study has been to determine the general subsurface conditions, evaluate the engineering characteristics of the subsurface materials encountered, and develop recommendations for the type or types of foundations suitable for the project.

To accomplish its intended purpose, the study has been conducted in the following phases: (1) drilling sample borings to determine the general subsurface conditions and to obtain samples for testing; (2) performing laboratory tests on appropriate samples to determine pertinent engineering properties of the subsurface materials; and (3) performing engineering analyses, using the field and laboratory data to develop geotechnical recommendations for the proposed construction.

The design is currently in progress and the locations and/or elevations of the structure could change. Once the final design is near completion (80-percent to 90-percent stage), it is recommended that CMJ Engineering, Inc. be retained to review those portions of the construction documents pertaining to the geotechnical recommendations, as a means to determine that our recommendations have been interpreted as intended.

1.3 Report Format

The text of the report is contained in Sections 1 through 11. All plates and large tables are contained in Appendix A. The alpha-numeric plate and table numbers identify the appendix in which they appear. Small tables of less than one page in length may appear in the body of the text and are numbered according to the section in which they occur.

Units used in the report are based on the English system and may include tons per square foot (tsf), kips (1 kip = 1,000 pounds), kips per square foot (ksf), pounds per square foot (psf), pounds per cubic foot (pcf), and pounds per square inch (psi).

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Subsurface materials at the project site were explored by two (2) vertical soil borings drilled to a depth of 35 feet. The borings were drilled using continuous flight augers at the approximate locations shown on the Plan of Borings, Plate A.1. The boring logs are included on Plates A.4 and A.5 and keys to classifications and symbols used on the log are provided on Plates A.2 and A.3.

Undisturbed samples of cohesive soils were obtained with nominal 3-inch diameter thin-walled (Shelby) tube samplers at the locations shown on the logs of borings. The Shelby tube sampler consists of a thin-walled steel tube with a sharp cutting edge connected to a head equipped with a ball valve threaded for rod connection. The tube is pushed into the soil by the hydraulic pulldown of the drilling rig. The soil specimens were extruded from the tube in the field, logged, tested for consistency with a hand penetrometer, sealed, and packaged to limit loss of moisture.

The consistency of cohesive soil samples was evaluated in the field using a calibrated hand penetrometer. In this test a 0.25-inch diameter piston is pushed into the relatively undisturbed sample at a constant rate to a depth of 0.25 inch. The results of these tests, in tsf, are tabulated at respective sample depths on the log. When the capacity of the penetrometer is exceeded, the value is tabulated as 4.5+.

To evaluate the relative density and consistency of the harder formations, a modified version of the Texas Cone Penetration test was performed at selected locations. Texas Department of Transportation (TXDOT) Test Method Tex-132-E specifies driving a 3-inch diameter cone with a 170-pound hammer freely falling 24 inches. This results in 340 foot-pounds of energy for each blow. This method was modified by utilizing a 140-pound hammer freely falling 30 inches. This results in 350 foot-pounds of energy for each hammer blow. In relatively soft materials, the penetrometer cone is driven 1 foot and the number of blows required for each 6-inch penetration is tabulated at respective test depths, as blows per 6 inches on the log. In hard materials (rock or rock-like), the penetrometer cone is driven with the resulting penetrations, in inches, recorded for the first and

second 50 blows, a total of 100 blows. The penetration for the total 100 blows is recorded at the respective testing depths on the boring log.

2.2 Laboratory Testing

Laboratory soil tests were performed on selected representative samples recovered from the borings. In addition to the classification tests (liquid limits and plastic limits), moisture content, unit weight, and unconfined compressive strength tests were performed. Results of the laboratory classification tests, moisture content, unit weight, and unconfined compressive strength tests conducted for this project are included on the boring logs.

A swell test was performed on a specimen from a selected sample of the clays. This test was performed to help in evaluating the swell potential of soils in the area of proposed structure. The results of the swell test are presented on Plate A.6.

The above laboratory tests were performed in general accordance with applicable ASTM procedures, or generally accepted practice.

3.0 SUBSURFACE CONDITIONS

3.1 Soil Conditions

Specific types and depths of subsurface strata encountered in the borings are shown on the boring logs in Appendix A. The generalized subsurface stratigraphy encountered in the borings is discussed below. Note that depths on the borings refers to the depth from the existing grade or ground surface present at the time of the investigation, and the boundaries between the various soil types are approximate.

Surficial soils encountered consist of brown and light brown silty clays and clays. Tan limestone containing clay seams and layers is next present in Borings B-1 and B-2 at a depth of 8 feet and extends to a depth of 13 feet. The tan limestone is moderately hard to hard (rock basis), with Texas Cone Penetration (THD) test values of 2 to 2¾ inches per 100 blows. Tan, light brown and gray silty clays and silty shaly clays are next encountered in Borings B-1 and B-2 at a depth of 13 feet. The various clays occasionally contain limestone fragments, calcareous nodules, calcareous deposits, ironstone nodules, iron stains, and gravel. Limestone seams and layers are present within the silty

clays in Boring B-2 below a depth of 13 feet and gray shale seams are present within the silty shaly clays in Boring B-1 below a depth of 27 feet.

The various clays encountered at the site had tested Liquid Limits (LL) of 38 to 53 with Plasticity Indices (PI) of 23 to 34 and are classified as CL and CH by the USCS. The clayey soils were stiff to hard (soil basis) in consistency with pocket penetrometer readings of 1.5 to over 4.5 tsf. Unit dry weight values varied from 93 to 122 pcf and tested soil unconfined compressive strengths ranged from 2,600 to 8,530 psf.

Gray shale and clayey shale are next encountered in both borings at depths of 29 to 30 feet and continues through boring termination at a depth of 35 feet. The gray clayey shale is soft (rock basis) with a pocket penetrometer reading of over 4.5 tsf. The gray shale is moderately hard to hard (rock basis), with Texas Cone Penetration (THD) test values of 2 to 2¼ inches per 100 blows.

The Atterberg Limits tests indicate the clays encountered at this site are moderately active to highly active with respect to moisture induced volume changes. Active clays can experience volume changes (expansion or contraction) with fluctuations in their moisture content.

3.2 Ground-Water Observations

The borings were drilled using continuous flight augers in order to observe ground-water seepage during drilling. Ground-water seepage was not encountered during drilling in the borings, and the boreholes were dry at completion of drilling operations.

Fluctuations of the ground-water level can occur due to seasonal variations in the amount of rainfall; site topography and runoff; hydraulic conductivity of soil strata; and other factors not evident at the time the borings were performed. During wet periods of the year seepage can occur in joints in the clays or atop or within the tan limestone. The possibility of ground-water level fluctuations should be considered when developing the design and construction plans for the project.

4.0 FOUNDATION RECOMMENDATIONS

4.1 General Foundation Considerations

Two independent design criteria must be satisfied in the selection of the type of foundation to support the proposed structure. First, the ultimate bearing capacity, reduced by a sufficient factor of safety,

must not be exceeded by the bearing pressure transferred to the foundation soils. Second, due to consolidation or expansion of the underlying soils during the operating life of the structure, total and differential vertical movements must be within tolerable limits. The recommended foundation alternatives for the proposed building are discussed below.

The most positive foundation system consists of straight drilled reinforced concrete shafts penetrating the gray shale. Consideration can be given to a monolithic, slab-on-grade foundation system if movement can be tolerated and the slab is designed to tolerate potential movements due to moisture induced volume changes in the surficial soils without inducing unacceptable distress in the foundation or structural elements. Recommendations for both systems are presented below.

4.2 Expansive Soil Movements

The expansive soils encountered at this site can shrink and swell as the soil moisture content fluctuates during seasonal wet and dry cycles. Additionally, the site environment is impacted by grading and drainage, landscaping, ground-water conditions, paving and many other factors which affect the structure during and after construction. Therefore, the amount of soil movements is difficult to determine due to the many unpredictable variables involved.

Estimates of soil movements for this site have been performed using data from the Texas Department of Transportation (TxDOT) procedure TEX-124-E for estimating Potential Vertical Rise (PVR), swell tests, and using engineering judgment and experience. Vertical soil movements on the order of 2 inches have been estimated for the soils encountered, as the soils undergo moisture changes.

The estimated soil movements are based on the subsurface conditions revealed by the borings and for seasonal moisture fluctuations. Soil movements, significantly larger than estimated, could occur if soils are exposed, are allowed to dry, and subsequently re-moistened and swell.

Site grading can affect potential vertical movements. For example, fills using on-site or similar clays will increase the total clay thickness thereby increasing the potential vertical rise. This office should be contacted for additional recommendations if clay fills in excess of 12 inches are used within the building pad.

4.3 Straight Shaft Design Parameters

Recommendations and parameters for the design of cast-in-place straight-shaft drilled piers are outlined below. Specific recommendations for the construction and installation of the straight-shaft drilled piers are included in the following section, and shall be followed during construction.

Bearing Stratum	Moderately hard to hard gray SHALE
Depth of Bearing Stratum:	Approximately 30 feet below <u>existing</u> grades
Required Penetration/Depth:	All piers should penetrate into the bearing stratum a minimum of 3 feet. Deeper penetrations may be required to develop additional skin friction and/or uplift resistance.
Allowable End Bearing Capacity:	18,000 psf
Allowable Skin Friction:	Applicable below a minimum penetration of 3 feet into gray shale and below any temporary casing; for compressive loads use 2,700 psf, for tensile loads use 1,800 psf.

The above values contain a safety factor of three (3). Penetrations greater than the minimum penetration may be required to develop additional skin friction and/or uplift resistance.

Drilled shafts should extend through any clayey shale seams and layers and bear only in competent unweathered gray shale.

In order to develop full load carrying capacity in skin friction, adjacent shafts (both new and existing) should have a minimum center to center spacing of 3 times the diameter of the larger shaft. Closer spacing may require some reductions in skin friction and/or changes in installation sequences. Closely spaced shafts should be examined on a case by case basis. As a general guide, the design skin friction will vary linearly from the full value at a spacing of 3 diameters to 50 percent of the design value at 1.0 diameter.

Settlements for properly installed and constructed straight shafts in the gray shale will be primarily elastic and are estimated to be one inch or less.

4.4 Soil Induced Uplift Loads

The straight drilled shafts could experience tensile loads as a result of post construction heave in the site soils. The magnitude of these loads varies with the shaft diameter, soil parameters, and particularly the in-situ moisture levels at the time of construction. In order to aid in the structural

design of the reinforcement, the reinforcement quantity should be adequate to resist tensile forces based on soil adhesion equal to 1,400 psf acting over the upper 8 feet of the pier shaft. This load must be resisted by the dead load on the shaft, continuous vertical reinforcing steel in the shaft, and a shaft adhesion developed within the bearing strata as previously discussed for straight shafts. In order to aid in the structural design of the reinforcement, minimum reinforcing should be equal to 0.5 percent of the shaft area.

4.5 Drilled Shaft Construction Considerations

Care must be taken not to disturb the foundation system of the existing building.

Drilled pier construction should be monitored by a representative of the geotechnical engineer to observe, among other things, the following items:

- Identification of bearing material
- Adequate penetration of the shaft excavation into the bearing layer
- The base and sides of the shaft excavation are clean of loose cuttings
- If seepage is encountered, whether it is of sufficient amount to require the use of temporary steel casing. If casing is needed it is important that the field representative observe that a high head of plastic concrete is maintained within the casing at all times during their extraction to prevent the inflow of water

Excavations for the shafts should be maintained in the dry. Precautions should be taken during the placement of reinforcing steel and concrete to prevent loose, excavated soil from falling into the excavation. Concrete should be placed as soon as practical after completion of the drilling, cleaning, and observation. Excavation for a drilled pier should be filled with concrete before the end of the workday, or sooner if required to prevent deterioration of the bearing material. Prolonged exposure or inundation of the bearing surface with water will result in changes in strength and compressibility characteristics. If delays occur, the drilled pier excavation should be deepened as necessary and cleaned, in order to provide a fresh bearing surface.

The concrete should have a slump of 6 inches plus or minus 1 inch. The concrete should be placed in a manner to prevent the concrete from striking the reinforcing cage or the sides of the excavation. Concrete should be tremied to the bottom of the excavation to control the maximum free fall of the plastic concrete to less than 10 feet, or focus concrete in the middle of the reinforcing cage to prevent segregation.

A drilling rig of sufficient size and weight will be necessary for drilling and/or coring through the hard layers to reach the desired bearing stratum and achieve the required penetration. It should be anticipated that hard to very hard zones can be present in the tan limestone and gray shale. The hard to very hard layers can complicate pier drilling operations.

In addition to the above guidelines, the specifications from the Association of Drilled Shaft Contractors Inc. "Standards and Specifications for the Foundation Drilling Industry" as Revised 1999 or other recognized specifications for proper installation of drilled shaft foundation systems should be followed.

4.6 Grade Beams

All grade beams should be supported by the drilled shafts. A minimum 6-inch void space should be provided beneath all grade beams to prevent contact with the swelling clay soils. This void will serve to minimize distress resulting from swell pressures generated by the clays.

Grade beams may be cast on cardboard carton forms or formed above grade. If cardboard carton forms are used, care should be taken to not crush the carton forms, or allow the carton forms to become wet prior to or during concrete placement operations. A soil retainer should be provided to help prevent in-filling of this void.

Backfill against the exterior face of grade beams or panels should be properly compacted on-site clays. Compaction should be a minimum of 93 percent of ASTM D698, at a minimum of 2 percentage points above the optimum moisture content determined by that test. This clay fill is intended to reduce surface water infiltration beneath the structure.

4.7 Stiffened Monolithic, Slab-On-Grade

A stiffened, monolithically placed slab-on-grade foundation, either rebar or post-tensioned, used at this site must be designed with exterior and interior grade beams to provide sufficient rigidity to tolerate the differential soil movements. These differential movements will typically occur between the periphery and interior of the slab-on-grade system. Foundation movements are anticipated to occur primarily due to post construction heave of the underlying soils but also can occur due to shrinkage of the clays around the perimeter of the slab. It is recommended that all fill soils be properly placed and compacted in accordance with this report section and report Section 8.0 prior to foundation installation.

Reductions in anticipated movements can be achieved by using methods developed in this area to reduce on-grade slab movements. The more commonly used methods consist of placing non-expansive select fill beneath the slab and moisture conditioning the soils. The use of these methods will not eliminate the risk of unacceptable movements.

Consideration should be given to extending the moisture conditioning process beyond the building line to include entrances, flatwork, sidewalks, or any other areas sensitive to movement. Outside the building, a poly barrier capped with a minimum 6 inches of select fill is recommended. The poly barrier should extend a minimum of 5 feet away from the foundation edge and should slope down slightly to shed excess moisture away from the structure. The use of these methods will not eliminate the risk of unacceptable movements.

Slab-on-grade construction only should be considered if slab movement can be tolerated. The owner must fully understand that if the floor slab is placed on-grade, some movement and resultant cracking within the floor and interior wall partitions may occur. This upward slab movement and cracking usually is difficult and costly to repair, and may require continued maintenance expense. Moisture conditioning is recommended to be achieved by mechanically reworking the clays as discussed below.

The foundation should be designed by a structural engineer familiar with stiffened slabs-on-grade subject to differential movement. Design parameters are presented below for PVR and differential swell using the Post-Tensioning Institute's (PTI) slab-on-grade design method, 3rd Edition.

With Moisture-Conditioned Pad*	
Design Potential Vertical Rise	1.0 inch*
Edge Moisture Variation -	
Approximate Center Lift:	8.7 feet*
Approximate Edge Lift:	4.4 feet*
Differential Swell -	
Approximate Center Lift:	0.7 inch*
Approximate Edge Lift:	1.1 inches*

* Valid only after 3 feet of moisture conditioning with 1-foot select fill cap as described in Section 5.3.

It should be recognized that a post tensioned or conventionally reinforced slab-on-grade foundation system placed at this site will be subject to differential movements as indicated above. If slab

stiffness is not sufficient to resist the ground movements, these movements can cause cracking of interior sheet rock walls and exterior brick walls. Poor drainage, water leaks, free water sources, long term percolation in recessed planter areas and/or trees can result in greater differential movements. For example, should leaks develop in underground water or sewer lines or the grades around the structures are changed and cause ponding of water, unacceptable slab movements could develop. A greater risk of unsatisfactory foundation performance exists with a slab-on-grade design than for a drilled shaft design.

The grade beams of the slab-on-grade foundation system should exert a maximum bearing pressure of 1,800 psf. These beams should extend a minimum of 18 inches below finished grade and bear in properly compacted and tested fill. The beam depth is given in regard to bearing capacity, and is not intended to be a structural recommendation.

A properly engineered and constructed moisture barrier should be provided beneath the slab-on-grade.

The key to the success of slab performance includes obtaining the proper design parameters for design, designing the slab for the representative movements anticipated, and construction and post-construction techniques to reduce the possibility of undue movements. Expansive soils will neither heave nor shrink unless the actual moisture content of the soil changes. Therefore, maintaining as constant a moisture content aside and below slab foundations becomes of paramount importance to reduction of soil movements. Providing excellent drainage away from the structure, preventing ponding water aside the slab, and using relatively impermeable backfill to prevent water intrusion via utility line backfill enhance the slab performance.

5.0 FLOOR SLABS & EXTERIOR FLATWORK

5.1 Potential Vertical Movements

Lightly loaded floor slabs placed on-grade and exterior flatwork will be subject to movement as a result of moisture induced volume changes in the moderately active to highly active clays. The clays expand (heave) with increases in moisture and contract (shrink) with decreases in moisture. The movement typically occurs as post construction heave. The potential magnitude of the moisture induced movements is rather indeterminate. It is influenced by the soil properties, overburden pressures, and to a great extent by soil moisture levels at the time of construction. The greatest

potential for post-construction movement occurs when the soils are in a dry condition at the time of construction. Based on the conditions encountered in the borings, potential moisture induced movements are estimated to be on the order of 2 inches for soils in a dry condition, as previously discussed.

Site grading can affect potential vertical movements. For example, fills using on-site or similar clays will increase the total clay thickness thereby increasing the potential vertical rise. This office should be contacted for additional recommendations if clay fills in excess of 12 inches are used within the building pad.

5.2 Structurally Suspended Floor Slab

In conjunction with a drilled shaft foundation system the most positive method of preventing slab distress due to swelling soils is to structurally suspend the interior slab. Due to the expansion potential of the site clays we recommend that the suspended floor slab be constructed on carton forms with a minimum 8-inch void space or crawl space.

Care should be taken to assure that the void boxes are not allowed to become wet or crushed prior to or during concrete placement and finishing operations. Corrugated steel, placed on the top of the carton forms, could be used to reduce the risk of crushing of the carton forms during concrete placement and finishing operations. As a quality control measure during construction, "actual" concrete quantities placed should be checked against "anticipated" quantities. Significant concrete "overage" would be an early indication of a collapsed void.

Where a crawl space is used, provisions should be made to provide drainage from under the building. Ventilation of the void below the floors should be provided if high humidity can cause problems with floor tile adhesives.

Vehicle or pedestrian ramps leading up to the building should be structurally connected to the building grade beams to avoid abrupt differential movement between the building slab and the ramps. Transitioning details will be required at the points where ramps connect with paving and slab on grade elements. In addition, ramp slabs should be constructed so that slopes sufficient for effective drainage of surface water are still provided after potential differential movements.

5.3 Ground Supported Floor Slabs & Exterior Flatwork

In conjunction with drilled shafts, interior slabs and/or exterior flatwork can be placed on a prepared subgrade. Slab-on-grade construction should only be considered if slab movement can be tolerated. The level of acceptable movement varies with the user, but methods are normally selected with the goal of limiting slab movements to about one inch or less. Reductions in anticipated movements can be achieved by using methods developed in this area to reduce on-grade slab movements. The more commonly used methods consist of placing non-expansive select fill beneath the slab and moisture conditioning the soils. The use of these methods will not eliminate the risk of unacceptable movements.

Readers should understand that a ground-supported floor slab can heave considerably if placed on dry, expansive clays. The installation of a minimum of 1 foot of non-expansive select fill over a minimum of 3 feet of moisture conditioned clays should reduce potential movements to on the order of one inch. Moisture conditioning can be achieved by mechanically reworking the clays as described below. Slabs not capable of tolerating this level of movement should be structurally suspended. These recommendations should be reviewed once a grading plan is finalized.

Consideration should be given to extending the moisture conditioning process beyond the building line to include entrances, flatwork, porte-cocheres, pavements or any other areas sensitive to movement. Outside the building, a single lift of select fill (6 to 8 inches) is recommended to minimize drying during construction.

Soil treatments presented in this section are referenced as an alternative to the use of a structurally suspended floor slab. The owner must fully understand that if the floor slab is placed on-grade, some movement and resultant cracking within the floor and interior wall partitions may occur. This upward slab movement and cracking is usually difficult and costly to repair, and may require continued maintenance expense.

These methods of treatment are presented as an option for the owner's consideration. The options may or may not be practical or economically feasible, depending on the expected performance of the proposed structure. The owner should be aware that this method will not prevent movement of soil-supported foundation elements, and can only reduce the magnitude of the movement. Placement of the floor slab-on-grade represents a compromise between construction cost and risk of floor distress.

A properly engineered and constructed vapor barrier should be provided beneath slabs-on-grade which will be carpeted or receive moisture sensitive coverings or adhesives.

In general, the following procedure is recommended to be performed to provide a moisture-conditioned pad:

1. Remove all existing pavements, surface vegetation, trees and associated root mats, organic topsoil and any other deleterious material.
2. Excavate to a minimum of 3.5 feet below finished grade. Scarify the exposed subgrade at the base of the excavation to a depth of 8 inches, adjust the moisture, and compact at a minimum of 2 percentage points above optimum moisture to between 93 and 98 percent Standard Proctor density (ASTM D 698). Over-compaction should not be allowed.
3. Fill pad to 1 foot below final grade using site excavated or similar sandy clay soils. Compact in maximum 9-inch loose lifts at a minimum of 2 percentage points above optimum moisture to between 93 and 98 percent Standard Proctor density (ASTM D 698). Over-compaction should not be allowed.
4. Complete pad fill using a minimum of 1 foot of sandy clay/clayey sand non-expansive select fill with a Liquid Limit less than 35 and a Plasticity Index (PI) between 5 and 16. The select fill should be compacted in maximum 9-inch loose lifts at minus 2 to plus 3 percentage points of the soil's optimum moisture content at a minimum of 95 percent of Standard Proctor density (ASTM D 698). The select fill should be placed within 48 hours of completing the installation of the moisture conditioned soils.

6.0 EXPANSIVE SOIL CONSIDERATIONS

6.1 Potential Vertical Movements

The expansive soils encountered at this site can shrink and swell as the soil moisture content fluctuates during seasonal wet and dry cycles. Additionally, the site environment is impacted by grading and drainage, landscaping, ground-water conditions, paving and many other factors which affect the structure during and after construction. Therefore, the amount of soil movement is difficult to determine due to the many unpredictable variables involved.

The estimated soil movements are based on the subsurface conditions revealed by the borings and on seasonal moisture fluctuations. Soil movements, significantly larger than estimated, could occur due to inadequate site grading, poor drainage, ponding of rainfall, and/or leaking pipelines.

6.2 Site Drainage

An important feature of the project is to provide positive drainage away from the proposed building. If water is permitted to stand next to or below the structure, excessive soil movements (heave) can occur. This could result in differential floor slab or foundation movement.

A well-designed site drainage plan is of utmost importance and surface drainage should be provided during construction and maintained throughout the life of the structure. Consideration should be given to the design and location of gutter downspouts, planting areas, or other features which would produce moisture concentration adjacent to or beneath the structure or paving. Joints next to the structure should be sealed with a flexible joint sealer to prevent infiltration of surface water. Proper maintenance should include periodic inspection for open joints and cracks and resealing as necessary.

6.3 Additional Design Considerations

The following information has been assimilated after examination of numerous projects constructed in active soils throughout the area. It is presented here for your convenience. If these features are incorporated in the overall design of the project, the performance of the structure should be improved.

- Special consideration should be given to completion items outside the building area, such as stairs, sidewalks, signs, etc. They should be adequately designed to sustain the potential vertical movements mentioned in the report.
- Roof drainage should be collected by a system of gutters and downspouts and transmitted away from the structure where the water can drain away without entering the building subgrade.
- Sidewalks should not be structurally connected to the building. They should be sloped away from the building so that water will drain away from the structure.
- The paving and the general ground surface should be sloped away from the building on all sides so that water will always drain away from the structure. Water should not be allowed to pond near the building after the slab has been placed.
- Every attempt should be made to limit the extreme wetting or drying of the subsurface soils since swelling and shrinkage will result. Standard construction practices of providing good surface water drainage should be used. A positive slope of the ground away from the foundation should be provided to carry off the run-off water both during and after construction.

- Trees and deep rooted shrubs should not be used as landscaping around the structure perimeter as the root systems can lead to desiccation of the subgrade soils. Any existing trees or trees to be planted should be at a distance from the building such that the building will not fall within the drip line of the mature plants (usually one to one-and-one-half times the mature height of the tree). If existing tree removal is not an acceptable option, a vertical root barrier, extending to a minimum depth of 4 feet, should be constructed around the perimeter of the foundation in proximity to the area described above.
- Backfill for utility lines or along the perimeter beams should consist of on-site material so that they will be stable. If the backfill is too dense or too dry, swelling may form a mound along the ditch line. If the backfill is too loose or too wet, settlement may form a sink along the ditch line. Either case is undesirable since several inches of movement is possible and floor cracks are likely to result. The soils should be processed using the previously discussed compaction criteria.
- Utility line details and fixtures must consider the potential for differential movement beneath any piping. In conjunction with a structural slab all underground utility lines should be isolated from expansive clays. A similar 8-inch void is recommended between the utility bottom and underlying clay soils. This prevents the utility lines from uplifting into the suspended slab.

7.0 SEISMIC CONSIDERATIONS

Based on the conditions encountered in the borings for the above referenced project the IBC-2016 site classification is TYPE D for seismic evaluation.

8.0 EARTHWORK

8.1 Site Preparation and Material Requirements

The existing ground surface should be stripped of vegetation, roots, deleterious materials, and old construction debris. It is estimated that the depth of stripping will be on the order of 4 to 8 inches. The actual stripping depth should be based on field observations with particular attention given to old drainage areas, uneven topography, and excessively wet soils. The stripped areas should be observed to determine if additional excavation is required to remove weak or otherwise objectionable materials that would adversely affect the fill placement or other construction activities.

The subgrade should be firm and able to support the construction equipment without displacement. Soft or yielding subgrade should be corrected and made stable before construction proceeds. The subgrade should be proof rolled to detect soft spots, which if exist, should be excavated to provide a firm and otherwise suitable subgrade. Proof rolling should be performed using a heavy pneumatic

tired roller, loaded dump truck, or similar piece of equipment. The proof rolling operations should be observed by the project geotechnical engineer or his/her representative.

The on-site soils are suitable for use in general site grading outside the building area. Imported general fill material should be clean soil with a Liquid Limit less than 50 and no rock greater than 4 inches in maximum dimension. All fill materials should be free of vegetation and debris.

8.2 Placement and Compaction

Fill material should be placed in loose lifts not exceeding 9 inches in uncompacted thickness. The uncompacted lift thickness should be reduced to 4 inches for structure backfill zones requiring hand-operated power compactors or small self-propelled compactors. The fill material should be uniform with respect to material type and moisture content. Clods and chunks of material should be broken down and the fill material mixed by disking, blading, or plowing, as necessary, so that a material of uniform moisture and density is obtained for each lift. Water required for sprinkling to bring the fill material to the proper moisture content should be applied evenly through each layer.

The fill material should be compacted to a density ranging from 95 to 100 percent of maximum dry density as determined by ASTM D 698, Standard Proctor. In conjunction with the compacting operation, the fill material should be brought to the proper moisture content. The moisture content for general earth fill should range from 2 percentage points below optimum to 5 percentage points above optimum (-2 to +5). These ranges of moisture contents are given as maximum recommended ranges. For some soils and under some conditions, the contractor may have to maintain a more narrow range of moisture content (within the recommended range) in order to consistently achieve the recommended density.

Field density tests should be taken as each lift of fill material is placed. As a guide, one field density test per lift for each 5,000 square feet of compacted area is recommended. For small areas or critical areas the frequency of testing may need to be increased to one test per 2,500 square feet. A minimum of 2 tests per lift should be required. The earthwork operations should be observed and tested on a continuing basis by an experienced geotechnician working in conjunction with the project geotechnical engineer.

Each lift should be compacted, tested, and approved before another lift is added. The purpose of the field density tests is to provide some indication that uniform and adequate compaction is being

obtained. The actual quality of the fill, as compacted, should be the responsibility of the contractor and satisfactory results from the tests should not be considered as a guarantee of the quality of the contractor's filling operations.

8.3 Trench Backfill

Trench backfill for utilities should be properly placed and compacted. Overly dense or dry backfill can swell and create a mound along the completed trench line. Loose or wet backfill can settle and form a depression along the completed trench line. Distress to overlying structures, pavements, etc. is likely if heaving or settlement occurs. On-site soil fill material is recommended for trench backfill. Care should be taken not to use free draining granular material, to prevent the backfilled trench from becoming a french drain and piping surface or subsurface water beneath structures, pipelines, or pavements. If a higher class bedding material is required for the pipelines, a lean concrete bedding will limit water intrusion into the trench and will not require compaction after placement. The soil backfill should be placed in approximately 4- to 6-inch loose lifts. The density and moisture content should be as recommended for fill in Section 8.2 of this report. A minimum of one field density test should be taken per lift for each 150 linear feet of trench, with a minimum of 2 tests per lift.

8.4 Excavation

The side slopes of excavations through the overburden soils should be made in such a manner to provide for their stability during construction. Existing structures, pipelines or other facilities, which are constructed prior to or during the currently proposed construction and which require excavation, should be protected from loss of end bearing or lateral support.

Temporary construction slopes and/or permanent embankment slopes should be protected from surface runoff water. Site grading should be designed to allow drainage at planned areas where erosion protection is provided, instead of allowing surface water to flow down unprotected slopes.

Trench safety recommendations are beyond the scope of this report. The contractor must comply with all applicable safety regulations concerning trench safety and excavations including, but not limited to, OSHA regulations.

8.5 Acceptance of Imported Fill

Any soil imported from off-site sources should be tested for compliance with the recommendations for the particular application and approved by the project geotechnical engineer prior to the materials being used. The owner should also require the contractor to obtain a written, notarized certification from the landowner of each proposed off-site soil borrow source stating that to the best of the landowner's knowledge and belief there has never been contamination of the borrow source site with hazardous or toxic materials. The certification should be furnished to the owner prior to proceeding to furnish soils to the site.

8.6 Soil Corrosion Potential

Specific testing for soil corrosion potential was not included in the scope of this study. However, based upon past experience on other projects in the vicinity, the soils at this site may be corrosive. Standard construction practices for protecting metal pipe and similar facilities in contact with these soils should be used.

8.7 Erosion and Sediment Control

All disturbed areas should be protected from erosion and sedimentation during construction, and all permanent slopes and other areas subject to erosion or sedimentation should be provided with permanent erosion and sediment control facilities. All applicable ordinances and codes regarding erosion and sediment control should be followed.

9.0 PAVEMENTS

9.1 Pavement Subgrade Preparation

Finished grades near the presently existing grade will consist of moderately to highly plastic clays. The higher plasticity clays (those with a PI of 20 or greater) are subject to loss in support value with the moisture increases which occur beneath pavement sections. They react with hydrated lime, which serves to improve and maintain their support value. Treatment of these soils with hydrated lime will improve their subgrade characteristics to support area paving. Lime treatment is recommended for all subgrade areas.

In lieu of a lime stabilized subgrade for pavement consisting of Portland cement concrete, the recommended PCC pavement thicknesses presented in Section 9.2 may be increased by 1 inch, and placed atop a properly compacted subgrade.

Alternatively, in lieu of a lime stabilized subgrade, a flexible base meeting TxDOT Item 247, Type A, Grades 1 or 2 may be utilized on an equal basis. The option of using a flexible base in lieu of lime stabilizing the subgrade presents a relatively quick, straight forward solution to preparing the subgrade prior to pavement placement.

Prior to lime stabilization or compaction, the subgrade should be proofrolled with heavy pneumatic equipment. Any soft or pumping areas should be undercut to a firm subgrade and properly backfilled as described in the Earthwork section. The stabilized subgrade should then be scarified to a minimum depth of 6 inches and uniformly compacted to a minimum of 95 percent of Standard Proctor density (ASTM D 698), to minus 2 to plus 4 percentage points of the optimum moisture content determined by that test. It should then be protected and maintained in a moist condition until the pavement is placed. The presence of calcareous nodules and limestone fragments in the surficial soils can complicate mixing of the soil and lime.

We recommend a minimum of 7 percent hydrated lime be used to modify the clay subgrade soils. The amount of hydrated lime required to stabilize the subgrade should be on the order of 32 pounds per square yard for a 6-inch depth, based on a soil dry unit weight of 100 pcf. The hydrated lime should be thoroughly mixed and blended with the upper 6 inches of the clay subgrade (TxDOT Item 260). The hydrated lime should meet the requirements of Item 260 in the Texas Department of Transportation (TxDOT) Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition. Lime treatment should extend beyond exposed pavement edges to reduce the effects of shrinkage and associated loss of subgrade support.

We recommend that subgrade stabilization extend to at least one foot beyond pavement edges to aid in reducing pavement movements and cracking along the curb line due to seasonal moisture variations after construction. Each construction area should be shaped to allow drainage of surface water during earthwork operations, and surface water should be pumped immediately from each construction area after each rain and a firm subgrade condition maintained. Water should not be allowed to pond in order to prevent percolation and subgrade softening, and lime should be added to the subgrade after removal of all surface vegetation and debris. Sand should be specifically

prohibited beneath pavement areas, since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils (lime stabilized soil will be allowed for fine grading). After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompact to obtain a tight non-yielding subgrade.

Surface drainage is critical to the performance of this pavement. Water should be allowed to exit the pavement surface quickly. All pavement construction should be performed in accordance with the following procedures.

9.2 Pavement Sections

The project may include the construction of parking lots and/or drives. At the time of this investigation, site paving plans or vehicle traffic studies were not available. Therefore, several rigid and flexible pavement sections are presented for a 20-year design life based on our experience with similar facilities for Light-Duty Parking Areas, Medium-Duty Parking Areas and Drives, and Medium-to Heavy-Duty Drives. In general, these areas are defined as follows:

Light-Duty Parking Areas are those lots and drives subjected almost exclusively to passenger cars, with an occasional light- to medium-duty truck (2 to 3 per week)

Medium-Duty Parking Areas and Drives are those lots subjected to a variety of light-duty vehicles to medium-duty vehicles and an occasional heavy-duty truck to include an 85 kip fire apparatus (1 to 2 per week).

Medium- to Heavy-Duty Drives are those drives subjected to a variety of light to heavy-duty vehicles. These pavements include areas subject to significant truck traffic or trash vehicles.

We recommend that rigid pavements be utilized at this project whenever possible, since they tend to provide better long-term performance when subjected to significant slow moving and turning traffic.

If asphaltic concrete pavement is used, we recommend a full depth asphaltic concrete section having a minimum total thickness of 5 inches for light-duty parking areas and 6 inches for medium-duty parking areas and drives. A minimum surface course thickness of 2 inches is recommended for asphaltic concrete pavements.

If Portland cement concrete pavement is used, a minimum thickness of 5 inches of concrete is recommended for light-duty parking areas, 6 inches for medium-duty parking areas and drives, and 7 inches for medium to heavy-duty areas.

A California Bearing Ratio or other strength tests were not performed because they were not within the scope of our services on this project. A subgrade modulus of 100 psi was considered appropriate for the near-surface soils. If heavier vehicles are planned, the above cross sections can be confirmed by performing strength tests on the subgrade materials once the traffic characteristics are established. Periodic maintenance of pavement structures normally improves the durability of the overall pavement and enhances its expected life.

The above sections should be considered minimum pavement thicknesses and higher traffic volumes and heavy trucks may require thicker pavement sections. Additional recommendations can be provided after traffic volumes and loads are known. Periodic maintenance should be anticipated for minimum pavement thickness. This maintenance should consist of sealing cracks and timely repair of isolated distressed areas.

9.3 Pavement Material Requirements

Reinforced Portland Cement Concrete: Reinforced Portland cement concrete pavement should consist of Portland cement concrete having a 28-day compressive strength of at least 3,500 psi. The mix should be designed in accordance with the ACI Code 318 using 3 to 6 percent air entrainment. The pavement should be adequately reinforced with temperature steel and all construction joints or expansion/contraction joints should be provided with load transfer dowels. The spacing of the joints will depend primarily on the type of steel used in the pavement. We recommend using No. 3 steel rebar spaced at 18 inches on center in both the longitudinal and transverse direction. Control joints formed by sawing are recommended every 12 to 15 feet in both the longitudinal and transverse direction. The cutting of the joints should be performed as soon as the concrete has "set-up" enough to allow for sawing operations.

Hot Mix Asphaltic Concrete Surface Course: Item 340, Type D, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 Edition.

Hot Mix Asphaltic Concrete Base Course: Item 340, Type A or B, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 Edition.

Lime Stabilized Subgrade: Lime treatment for base course (road mix) - Item 260, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 Edition.

Flexible Base: Crushed Stone Flexible Base – Item 247, Type A, Grades 1 or 2, Texas Department of Transportation Standard Specifications for Construction of Maintenance of Highways, Streets, and Bridges, 2014 Edition.

9.4 General Pavement Considerations

The design of the pavement drainage and grading should consider the potential for differential ground movement due to future soil swelling on the order of 2 inches. In order to minimize rainwater infiltration through the pavement surface, and thereby minimizing future upward movement of the pavement slabs, all cracks and joints in the pavement should be sealed on a routine basis after construction.

10.0 CONSTRUCTION OBSERVATIONS

In any geotechnical investigation, the design recommendations are based on a limited amount of information about the subsurface conditions. In the analysis, the geotechnical engineer must assume the subsurface conditions are similar to the conditions encountered in the borings. However, quite often during construction anomalies in the subsurface conditions are revealed. Therefore, it is recommended that CMJ Engineering, Inc. be retained to observe earthwork and foundation installation and perform materials evaluation during the construction phase of the project. This enables the geotechnical engineer to stay abreast of the project and to be readily available to evaluate unanticipated conditions, to conduct additional tests if required and, when necessary, to recommend alternative solutions to unanticipated conditions. Until these construction phase services are performed by the project geotechnical engineer, the recommendations contained in this report on such items as final foundation bearing elevations, proper soil moisture condition, and other such subsurface related recommendations should be considered as preliminary.

It is proposed that construction phase observation and materials testing commence by the project geotechnical engineer at the outset of the project. Experience has shown that the most suitable method for procuring these services is for the owner or the owner's design engineers to contract

directly with the project geotechnical engineer. This results in a clear, direct line of communication between the owner and the owner's design engineers and the geotechnical engineer.

11.0 REPORT CLOSURE

The boring logs shown in this report contains information related to the types of soil encountered at specific locations and times and show lines delineating the interface between these materials. The logs also contain our field representative's interpretation of conditions that are believed to exist in those depth intervals between the actual samples taken. Therefore, these boring logs contain both factual and interpretive information. Laboratory soil classification tests were also performed on samples from selected depths in the borings. The results of these tests, along with visual-manual procedures were used to generally classify each stratum. Therefore, it should be understood that the classification data on the logs of borings represent visual estimates of classifications for those portions of each stratum on which the full range of laboratory soil classification tests were not performed. It is not implied that these logs are representative of subsurface conditions at other locations and times.

With regard to ground-water conditions, this report presents data on ground-water levels as they were observed during the course of the field work. In particular, water level readings have been made in the borings at the times and under conditions stated in the text of the report and on the boring logs. It should be noted that fluctuations in the level of the ground-water table can occur with passage of time due to variations in rainfall, temperature and other factors. Also, this report does not include quantitative information on rates of flow of ground water into excavations, on pumping capacities necessary to dewater the excavations, or on methods of dewatering excavations. Unanticipated soil conditions at a construction site are commonly encountered and cannot be fully predicted by mere soil samples, test borings or test pits. Such unexpected conditions frequently require that additional expenditures be made by the owner to attain a properly designed and constructed project.

The analyses, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the borings at the time they were completed. If, during construction, different subsurface conditions from those

encountered in our borings are observed, or appear to be present in excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between submission of this report and the start of the work at the site, if conditions have changed due either to natural causes or to construction operations at or adjacent to the site, or if structure locations, structural loads or finish grades are changed, we urge that we be promptly informed and retained to review our report to determine the applicability of the conclusions and recommendations, considering the changed conditions and/or time lapse.

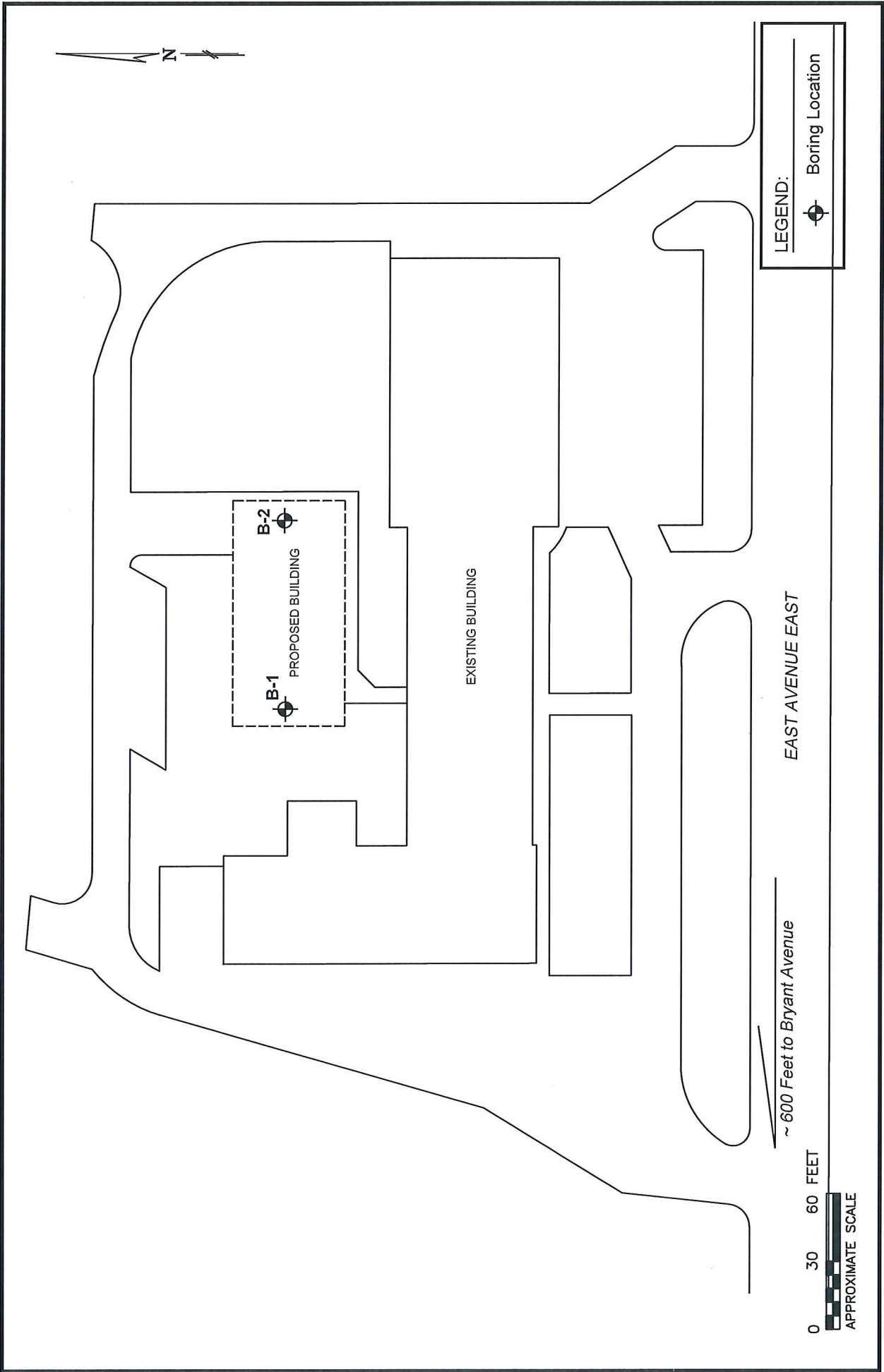
Further, it is urged that CMJ Engineering, Inc. be retained to review those portions of the plans and specifications for this particular project that pertain to earthwork and foundations as a means to determine whether the plans and specifications are consistent with the recommendations contained in this report. In addition, we are available to observe construction, particularly the compaction of structural fill, or backfill and the construction of foundations as recommended in the report and such other field observations as might be necessary.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, ground water or air, on or below or around the site.

This report has been prepared for use in developing an overall design concept. Paragraphs, statements, test results, boring logs, diagrams, etc. should not be taken out of context, nor utilized without a knowledge and awareness of their intent within the overall concept of this report. The reproduction of this report, or any part thereof, supplied to persons other than the owner, should indicate that this study was made for design purposes only and that verification of the subsurface conditions for purposes of determining difficulty of excavation, trafficability, etc. are responsibilities of the contractor.

This report has been prepared for the exclusive use of Midlothian ISD and their consultants for specific application to design of this project. The only warranty made by us in connection with the services provided is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.

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<p>Plate A.1</p>	<p>PLAN OF BORINGS Proposed Metal Building Laura Jenkins Development Center Midlothian, Texas</p>	<p> CMJ ENGINEERING, INC. CMJ Project No. 912-19-14</p>
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Major Divisions		Grp. Sym.	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils (more than half of the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}} \text{ greater than 4; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures	Liquid and Plastic limits below "A" line or P.I. greater than 4 Liquid and plastic limits plotting in hatched zone between 4 and 7 are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}} \text{ greater than 6; } C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} \text{ between 1 and 3}$
			SP	Poorly graded sands; gravelly sands, little or no fines	
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures	Liquid and Plastic limits below "A" line or P.I. less than 4 Liquid and plastic limits plotting between 4 and 7 are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	
				Determine percentages of sand and gravel from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent.....GW, GP, SW, SP More than 12 percent.....GM, GC, SM, SC 5 to 12 percent.....Borderline cases requiring dual symbols	Not meeting all gradation requirements for GW Not meeting all gradation requirements for SW
Fine-grained soils (More than half of material is smaller than No. 200 sieve)	Sils and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays		
		OL	Organic silts and organic silty clays of low plasticity		
	Sils and clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
		CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity, organic silts		
	Highly Organic soils	Pt	Peat and other highly organic soils		
				Plasticity Index Plasticity Chart	

SOIL OR ROCK TYPES

	GRAVEL		LEAN CLAY		LIMESTONE						
	SAND		SANDY		SHALE						
	SILT		SILTY		SANDSTONE						
	HIGHLY PLASTIC CLAY		CLAYEY		CONGLOMERATE	Shelby Tube	Auger	Split Spoon	Rock Core	Cone Pen	No Recovery

TERMS DESCRIBING CONSISTENCY, CONDITION, AND STRUCTURE OF SOIL

Fine Grained Soils (More than 50% Passing No. 200 Sieve)

Descriptive Item	Penetrometer Reading, (tsf)
Soft	0.0 to 1.0
Firm	1.0 to 1.5
Stiff	1.5 to 3.0
Very Stiff	3.0 to 4.5
Hard	4.5+

Coarse Grained Soils (More than 50% Retained on No. 200 Sieve)

Penetration Resistance (blows/foot)	Descriptive Item	Relative Density
0 to 4	Very Loose	0 to 20%
4 to 10	Loose	20 to 40%
10 to 30	Medium Dense	40 to 70%
30 to 50	Dense	70 to 90%
Over 50	Very Dense	90 to 100%

Soil Structure

Calcareous	Contains appreciable deposits of calcium carbonate; generally nodular
Slickensided	Having inclined planes of weakness that are slick and glossy in appearance
Laminated	Composed of thin layers of varying color or texture
Fissured	Containing cracks, sometimes filled with fine sand or silt
Interbedded	Composed of alternate layers of different soil types, usually in approximately equal proportions

TERMS DESCRIBING PHYSICAL PROPERTIES OF ROCK

Hardness and Degree of Cementation

Very Soft or Plastic	Can be remolded in hand; corresponds in consistency up to very stiff in soils
Soft	Can be scratched with fingernail
Moderately Hard	Can be scratched easily with knife; cannot be scratched with fingernail
Hard	Difficult to scratch with knife
Very Hard	Cannot be scratched with knife
Poorly Cemented or Friable	Easily crumbled
Cemented	Bound together by chemically precipitated material; Quartz, calcite, dolomite, siderite, and iron oxide are common cementing materials.

Degree of Weathering

Unweathered	Rock in its natural state before being exposed to atmospheric agents
Slightly Weathered	Noted predominantly by color change with no disintegrated zones
Weathered	Complete color change with zones of slightly decomposed rock
Extremely Weathered	Complete color change with consistency, texture, and general appearance approaching soil

KEY TO CLASSIFICATION AND SYMBOLS

PLATE A.3

Project No. 912-19-14		Boring No. B-1		Project Metal Building - Laura Jenkins Development Center Midlothian, TX												
Location See Plate A.1				Water Observations Dry during drilling; dry at completion												
Completion Depth 35.0'		Completion Date 8-9-19														
Depth, Ft.	Symbol	Samples	Surface Elevation		Type B-47 w/ CFA		REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
			Stratum Description													
					<u>CLAY</u> , brown and light brown, w/ limestone fragments, calcareous nodules and ironstone nodules, hard				4.5+					17		
					<u>SILTY CLAY</u> , light brown and brown, w/ calcareous nodules, calcareous deposits and occasional ironstone nodules, stiff to hard				4.5+					6		
5									2.5							
									4.5+					16		
					- w/ gravel below below 7'				4.5+		41	18	23	26	93	
10					<u>LIMESTONE</u> , tan, w/ clay seams, moderately hard				100/2.75'							
					<u>SILTY SHALY CLAY</u> , tan and gray, w/ calcareous deposits and occasional iron stains, hard				4.5+		49	21	28	19		
15																
									4.5+					16	102	2600
20																
									4.5+							
25																
					- w/ gray shale seams below 27'											
									4.5+					27		
30					<u>SHALE</u> , gray, moderately hard to hard											
									100/2"							
35																

LOG OF BORING NO. **B-1**

PLATE A.4

LOG OF BORING 912-19-14.GPJ CMJ.GDT 8/20/19

Project No. 912-19-14		Boring No. B-2		Project Metal Building - Laura Jenkins Development Center Midlothian, TX													
Location See Plate A.1				Water Observations Dry during drilling; dry at completion													
Completion Depth 35.0'		Completion Date 8-9-19															
Depth, Ft.	Symbol	Samples	Surface Elevation		Type B-47 w/ CFA		REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.	
			Stratum Description														
					<u>CLAY</u> , brown and light brown, w/ limestone fragments and calcareous nodules, hard - stiff below 2'				4.5+		53	19	34	14			
									4.5+						9	122	8530
					<u>SILTY CLAY</u> , brown and light brown, w/ calcareous nodules, calcareous deposits and occasional iron stains, hard				4.5+								
5									4.5+		38	15	23	15			
									4.5+						10		
10					<u>LIMESTONE</u> , tan, w/ clay seams and layers, moderately hard to hard				100/2"								
					<u>SILTY CLAY</u> , light brown and tan, w/ limestone seams and layers and calcareous deposits, very stiff to hard				4.5+						20		
15																	
20					- w/ ironstone nodules and iron stains below 19'				3.5						17	112	4890
									4.5+								
30					<u>CLAYEY SHALE</u> , gray, soft				4.5+						25		
					<u>SHALE</u> , gray, moderately hard												
									100/2.25"								
35																	

LOG OF BORING NO. B-2

PLATE A.5

LOG OF BORING 912-19-14.GPJ CMJ.GDT 8/20/19

FREE SWELL TEST RESULTS

Project: Metal Building – Laura Jenkins Development Center
Midlothian ISD
Midlothian, Texas

Project No.: 912-19-14

Boring No.	Depth Interval (ft.)	Sample Description	Liquid Limit	Plastic Limit	Plasticity Index	Moisture Content %		Percent Swell (%)
			LL	PL	PI	Initial	Final	
B – 1	7 – 8	Silty Clay	41	18	23	25.7	25.8	0.0

Free swell tests performed at approximate overburden pressure

**SECTION 00 4200
PROPOSAL FORM**

PART "A" - BASE BID AND ALTERNATES

DATE _____

1.01 TO:

Mr. Matt Sanders, President, Board of Trustees, Midlothian ISD, Midlothian, Texas.

- A. Having carefully examined the project manual, drawings, and related documents entitled: New Randall Hill Support Center as prepared by Huckabee, as well as the premises and conditions affecting the work, the undersigned proposes to furnish all materials, labor and equipment, and perform all work required by the contract documents for the construction of the New Randall Hill Support Center project, in accordance with said documents, of which this Proposal is a part, for the following sum:
- B. PROPOSAL ITEM NO. 1: For the construction of New Randall Hill Support Center for Midlothian ISD in compliance with and as shown on the drawings and herein specified for the sum of:

\$ _____

- C. Refer to Section 01 1400 Work Restrictions for specific project schedule. The Contractor acknowledges that they have read and understand the project schedule as stated in Section 01 1400. Please initial as acknowledged _____ (initials).
- D. The undersigned acknowledges _____ addenda to the project manual and drawings.
- E. The undersigned agrees, if awarded the contract, to execute and deliver to the Owner, at the time of the signing of the contract, a Performance and Payment Bond of approved form through an approved bonding company duly authorized to do business in the State of Texas, and currently listed in the Department of Treasury Federal Register, which is acceptable surety within their Uni underwriting limitations on bonds, in favor of the Midlothian ISD as specified in the Instructions To Proposers contained in the project manual.
- F. The undersigned further agrees that the Certified Check, Cashier's Check, or Proposal (Bid) Bond in the amount of five (5%) percent of his Proposal, payable to the Midlothian ISD, accompanying this Proposal, is left in escrow with the Architect, that it's amount is the measure of liquidated damages the Owner will sustain by the failure of the undersigned to execute and deliver the above-named agreement, or in furnishing the 100% Payment and Performance Bonds within ten (10) days of written notification of the award of the contract to him, then the Certified Check, Cashier's Check, or Proposal Bond shall become the property of the Owner; but if this Proposal is not accepted within forty-five (45) days of the time set for the submission of proposals, or if the undersigned executes and delivers said contract and bonds, the check shall be returned to him on receipt thereof.
- G. For each day that the completion of the project extends beyond the stipulated completion dates, the Contractor agrees to pay to the Owner the sum of Zero and no/100 Dollars (\$0.00) per day, and that this is the amount of liquidated damages the Owner will sustain for each day the time of completion of the project extends beyond the stipulated dates.
- H. If he is notified of the acceptance of this Proposal within forty-five (45) days of the time set for the opening of proposals, he agrees to execute a contract for the above work for the above-stated compensation in the form of the Standard Agreement of the American Institute of Architects.
- I. The undersigned agrees that the following unit prices may apply on any additions to, or deductions from the work, which prices shall include overhead, profit, taxes, and all other related costs. The unit prices shall be installed, in-place prices for materials/systems as specified. The quoted unit prices will be valid, and the quoted unit prices will be in force on any

work. A singular cost shall be provided below to be used for both additions and deductions. If different prices are provided for additions and deductions the average of the absolute values will be used. The materials and work shall be in compliance with the specifications. The Contractor shall not be compensated for work that is not authorized by the Architect or Owners Laboratory (e.g. over drilling of piers and additional concrete and reinforcement for over drilled piers)

UNIT PRICING MATERIAL/SYSTEM	UNITS	COST (\$)/UNIT
Excavation (Dirt or Caliche)	Cubic Yard	_____
Excavation (Rock)	Cubic Yard	_____
Backfilling (On Site)	Cubic Yard	_____
Reinforcing Steel, Straight or Bent	Pound	_____
Structural Concrete	Cubic Yard	_____
Temporary Casing for Drilling Geothermal Wells (4" Diameter)	Lineal Foot	_____
Uncased Drilled Piers - Complete including reinforcing, concrete, accessories and drilling		
24" Diameter	Lineal Foot	_____
Cased Drilled Piers - Complete including reinforcing, concrete, accessories, drilling and casing		
24" Diameter	Lineal Foot	_____

1.

- J. It is further agreed that extended periods of labor strikes, unusual and destructive weather conditions that are beyond the normal weather patterns, and other generally recognized "Acts of God" will be cause for an approved extension of the above-stipulated completion of time schedule. It is also agreed that a request for extension of time will be made in writing by the Contractor to the Architect within fifteen (15) days after the time of occurrence for any consideration to be given the request. It is agreed that no additional funds are allowed for Extensions of Time.

- K. Contractor has read and agrees with all provisions and articles of the contract documents.
Respectfully submitted,

Contractor: _____

Per: _____

VENDOR COMPLIANCE TO STATE LAW

Midlothian ISD

Please answer the following questions and return with this bid:

Texas law prohibits cities and governmental units from awarding contracts to a non-resident unless the amount of such proposal by a Texas resident by the amount the Texas resident would be required to underbid in the non-resident bidder's state. For information regarding this series of questions, see Article 601g of the Texas Civil Statutes.

Is your principal place of business in Texas? Yes No (Circle One)

If no, in which state is your principal place of business? _____

If your principal place of business is not Texas, does your state favor resident bidders in your state by some dollar increment or percentage? Yes No (Circle One)

If yes, what is that dollar increment or percentage? _____

AUTHORIZED SIGNATURE_____

NAME OF COMPANY_____

ADDRESS_____

CITY_____ STATE_ ZIP CODE_

DATE_____

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 Midlothian 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 Midlothian ISD, Midlothian, 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 Midlothian 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

END OF SECTION

SECTION 00 4335
PROPOSAL FORM PART "B" QUALIFICATIONS

DATE _____

TO:

Mr. Matt Sanders, President, Board of Trustees, Midlothian ISD, Midlothian, Texas.

THE CONTRACTOR SHALL PROVIDE THE FOLLOWING INFORMATION IN THE SEQUENCE AND FORMAT PRESCRIBED HEREIN AND AS OUTLINED IN THE INSTRUCTIONS TO PROPOSERS SECTION 00 2116, PARAGRAPH 2.04.A AND 2.04.B. SUPPLEMENTAL MATERIALS 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.

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. Members of the proposed team, once approved, shall not be changed without prior written approval of the Owner.

TAB 4: SUBCONTRACTORS:

Provide a list of all the major Subcontractors and Suppliers for each category listed below for this project.

• Earthwork	• Site Utilities
• Concrete	• Masonry
• Steel Fabrication	• Landscape and Irrigation
• Roofing	• Waterproofing
• Glass and Glazing	• Drywall
• Resilient Floor Covering/Carpet	• Ceramic Tile/Quarry Tile
• Terrazzo Flooring	• Painting
• Sprinkler System	• Plumbing
• Mechanical (HVAC)	• HVAC Controls

• Electrical	• Technology
• Fire Alarm	• Security
• Public Address	• Synthetic Turf and/or Running Tracks

You may provide a maximum of three (3) proposed Sub-contractors for each category. However, no additional Sub-contractors will be considered after submission of this list. Provide a resume and references for each firm and previous experience with the General Contractor. Only one (1) copy of the resumes is required. Provide resumes in a separate binder.

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. Reference Section 00 2116 for information regarding confidentiality.

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.

**TAB 9: FELONY CONVICTION NOTICE:
FELONY CONVICTION NOTIFICATION**

State of Texas Legislative Senate Bill No. 1, 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 an 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

**THIS NOTICE IS NOT REQUIRED OF A PUBLICLY-HELD CORPORATION
PLEASE COMPLETE THE INFORMATION BELOW**

I, undersigned agent for the firm named below, certify that the information concerning notification of felony conviction has been reviewed by me and the following information furnished is true to the best of my knowledge.

VENDOR'S NAME: _____

AUTHORIZED COMPANY OFFICIAL'S NAME (PRINTED): _____

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

Signature of Company Official: _____

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

Signature of Company Official: _____

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: _____

END OF SECTION

SECTION 00 4393

PROPOSAL SUBMITTAL CHECKLIST

THE FOLLOWING ITEMS ARE TO BE SUBMITTED TO MIDLOTHIAN ISD, AS DESCRIBED IN SECTION 00 2116 - INSTRUCTIONS TO PROPOSERS:

1.01 NOTE: ALL PROPOSALS MUST BE HAND-DELIVERED.

1.02 PROPOSAL FORM PART "A"

SUBMITTED ON JUNE 25, 2020 NO LATER THAN 2:00 P.M.

- A. Proposal Form – Part "A" – Base Bid Proposal
- B. () Bid Bond or Bid Security (Include base bid and all alternates)
- C. () Vendor Compliance to State Law
- D. () Notification of Hazardous Materials Affidavit

1.03 PROPOSAL FORM PART "B" – QUALIFICATIONS

SUBMITTED ON JUNE 25, 2020 NO LATER THAN 2:00 P.M.

- A. () Proposal Part "B" – Qualifications – five (5) copies of the information as outlined in the Proposal, Tabbed, and Bound.
- B. () Contractor's Qualification Statement AIA Document A305
- C. () Felony Conviction Notification Form

END OF SECTION



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 TWO THOUSAND TWENTY
(In words, indicate day, month and year.)

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

Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 972-775-8296
Fax: 972-775-1701

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

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

Randall Hill Support Center - Warehouse

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

Huckabee & Associates, Inc.
801 Cherry Street, Suite 500
Fort Worth, Texas 76102
Phone: 817-377-2969
Fax: 817-377-2303

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. 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.

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.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "™" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Russo & Kyle P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, 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.

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.
- ☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

Init.

§ 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 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: _____

§ 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 _____ AND ____/100 DOLLARS (\$ _____), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item

Price

§ 4.2.2 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.)

[If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time

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User Notes:

(793535337)

and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: FIVE HUNDRED AND NO/100 DOLLARS (\$500.00).

§ 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 last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the following 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 forty-five (45) days after the Architect receives the Application for Payment.

(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 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;
- .2 If approved in advance by the Owner, 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 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.

§ 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; 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 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.)

Five Percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 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.)

N/A

§ 5.1.7.3

(Paragraphs deleted)

Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10 of AIA Document A201-2017. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

§ 5.1.8 [Paragraph Deleted.]

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201-2017, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 Contractor has submitted Consent of Surety to Final Payment, and
- .3 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 31 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

(Paragraphs deleted)

Undisputed payments remaining unpaid under the Contract on the 31st day after the date the Owner receives a properly documented Certificate of Payment from the Architect are considered overdue and in accordance with the Texas Prompt Payment Act, Texas Government Code Chapter 2251, shall bear interest from that date until the date that the Owner mails or electronically transmits payment, including accrued interest to that date.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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 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

☒ 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

(Paragraphs deleted)

[Paragraph Deleted.]

§ 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)

Rola Fadel
Director of Architecture and Facilities
Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5025

§ 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 notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Contractor shall purchase and maintain insurance as set forth in AIA Document A201™–2017, General Conditions of the Contract for Construction, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017, and elsewhere in the Contract Documents. Despite reference in "Additions and Deletions" to the AIA 201-2007 Exhibit A, the correct reference and document applicable to this Project is the AIA 201-2017.

§ 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 Pursuant to Texas Government Code Chapter 2271, if this contract is valued at \$100,000 or more and if the Contractor has at least ten (10) full time employees, then the Contractor, by its execution of this Agreement represents and warrants to the Owner that the Contractor does not boycott Israel and will not boycott Israel during the term of this Agreement. This section does not apply to a sole proprietorship.

NOTE: On April 25, 2019, the U.S. District Court for the Western District of Texas entered a preliminary injunction enjoining the enforcement of the then-current version of Texas Government Code Chapter 2271 in any state contract. After the date of the injunction, Chapter 2271 was amended to narrow its applicability and the new statutory requirement is as stated above. As the amended statute may not cure the entire breadth of issues addressed by the injunction, the Owner does not intend to seek enforcement of this statute until further order of the Court which issued the injunction or higher court having jurisdiction over the issue.

§ 8.7.2 By signing this Agreement, the undersigned certifies as follows: Under Section 231.006 of the Texas Family Code, the Contractor certifies that the individual or business entity named in this Contract is not ineligible to receive the specified payments and acknowledges that this Contract may be terminated and payment withheld in this certification is inaccurate.

§ 8.7.3 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 Agreement.

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 [Subsection Deleted.]
- .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:

Init.

(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings – See Exhibit ____

Number	Title	Date
--------	-------	------

.6 Specifications – See Exhibit ____

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
----------	-------	------	-------

NOTE: Any Supplementary Conditions or other Conditions of this Contract listed above, the Project Manual or other terms or conditions attempted to be incorporated into this Contract, which contradict or conflict with the terms of this document or the terms and conditions set out in the AIA Document A201™–2017, General Conditions of the Contract for Construction shall be void and subordinate to the terms set out in the AIA Document A201™–2017, General Conditions of the Contract for Construction.

.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.)

Init.

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

**MIDLOTHIAN INDEPENDENT SCHOOL
DISTRICT**

OWNER *(Signature)*

Dr. Lane Ledbetter, Superintendent of Schools
(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

Init.

Additions and Deletions Report for AIA® Document A101® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 17:40:13 ET on 05/26/2020.

PAGE 1

AGREEMENT made as of the _____ day of _____ in the year TWO THOUSAND TWENTY

...

Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 972-775-8296
Fax: 972-775-1701

...

...

Randall Hill Support Center - Warehouse

...

Huckabee & Associates, Inc.
801 Cherry Street, Suite 500
Fort Worth, Texas 76102
Phone: 817-377-2969
Fax: 817-377-2303

...

The Owner and Contractor agree as follows:follows:

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EXHIBIT A — INSURANCE AND BONDS

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and

amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Russo & Kyle P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

...

[☒] A date set forth in a notice to proceed issued by the Owner.
PAGE 3

[☒] By the following date: _____

...

§ 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 (\$—), _____ AND _____/100 DOLLARS (\$ _____), subject to additions and deductions as provided in the Contract Documents.

...

[If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: FIVE HUNDRED AND NO/100 DOLLARS (\$500.00).

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§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the following 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 (—) forty-five (45) days after the Architect receives the Application for Payment.

...

- .2 ~~That If approved in advance by the Owner, 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, or~~ suitably stored off the site at a location agreed upon in writing; and

PAGE 5

Five Percent (5%)

...

N/A

...

N/A

§ 5.1.7.3 ~~Except as set forth in this Section 5.1.7.3, upon Substantial 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.)

Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10 of AIA Document A201-2017. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

~~§ 5.1.8 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.~~[Paragraph Deleted.]

...

- ~~.1~~ the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201-2017, and to satisfy other requirements, if any, which extend beyond final payment;
- ~~.2~~ Contractor has submitted Consent of Surety to Final Payment, and
- ~~.2~~ .3 a final Certificate for Payment has been issued by the Architect.

~~§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30~~31 days after the issuance of the Architect's final Certificate for Payment, or as follows:

...

~~Payments due and unpaid under the Contract shall bear interest 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.)~~

~~—%—~~Undisputed payments remaining unpaid under the Contract on the 31st day after the date the Owner receives a properly documented Certificate of Payment from the Architect are considered overdue and in accordance with the Texas Prompt Payment Act, Texas Government Code Chapter 2251, shall bear interest from that date until the date that the Owner mails or electronically transmits payment, including accrued interest to that date.

PAGE 6

For any Claim ~~subject to,~~ but not resolved by, ~~by~~ mediation pursuant to Article 15 of AIA Document A201-2017, the method of binding dispute resolution shall be as follows:

...

[X] Litigation in a court of competent jurisdiction

...

~~§ 7.1.1 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.)~~

[Paragraph Deleted.]

...

Rola Fadel
Director of Architecture and Facilities
Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5025

PAGE 7

...

§ 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, A201™-2017, General Conditions of the Contract for Construction, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™-2017 Exhibit A, A101™-2017, and elsewhere in the Contract Documents. Despite reference in "Additions and Deletions" to the AIA 201-2007 Exhibit A, the correct reference and document applicable to this Project is the AIA 201-2017.

...

§ 8.7.1 Pursuant to Texas Government Code Chapter 2271, if this contract is valued at \$100,000 or more and if the Contractor has at least ten (10) full time employees, then the Contractor, by its execution of this Agreement represents and warrants to the Owner that the Contractor does not boycott Israel and will not boycott Israel during the term of this Agreement. This section does not apply to a sole proprietorship.

NOTE: On April 25, 2019, the U.S. District Court for the Western District of Texas entered a preliminary injunction enjoining the enforcement of the then-current version of Texas Government Code Chapter 2271 in any state contract. After the date of the injunction, Chapter 2271 was amended to narrow its applicability and the new statutory requirement is as stated above. As the amended statute may not cure the entire breadth of issues addressed by the injunction, the Owner does not intend to seek enforcement of this this statute until further order of the Court which issued the injunction or higher court having jurisdiction over the issue.

§ 8.7.2 By signing this Agreement, the undersigned certifies as follows: Under Section 231.006 of the Texas Family Code, the Contractor certifies that the individual or business entity named in this Contract is not ineligible to receive the specified payments and acknowledges that this Contract may be terminated and payment withheld in this certification is inaccurate.

§ 8.7.3 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 Agreement.

...

PAGE 8 .2 AIA Document A101™-2017, Exhibit A, Insurance and Bonds [Subsection Deleted.]

.5 Drawings – See Exhibit ____

...

.6 Specifications – See Exhibit ____

...

NOTE: Any Supplementary Conditions or other Conditions of this Contract listed above, the Project Manual or other terms or conditions attempted to be incorporated into this Contract, which contradict or conflict with the terms of this document or the terms and conditions set out in the AIA Document A201™-2017, General Conditions of the Contract for Construction shall be void and subordinate to

the terms set out in the AIA Document A201™–2017, General Conditions of the Contract for Construction.

PAGE 9

**MIDLOTHIAN INDEPENDENT SCHOOL
DISTRICT**

...

Dr. Lane Ledbetter, Superintendent of Schools

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Elisabeth Nelson, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 17:40:13 ET on 05/26/2020 under Order No. 9957725202 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ – 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Randall Hill Support Center - Warehouse

THE OWNER:

(Name, legal status and address)

Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 972-775-8296
Fax: 972-775-1701

THE ARCHITECT:

(Name, legal status and address)

Huckabee & Associates, Inc.
801 Cherry Street, Suite 500
Fort Worth, Texas 76102
Phone: 817-377-2969
Fax: 817-377-2303

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11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK

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.

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

Init.

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(841961293)

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- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

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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), Drawings, Specifications, 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. The Contract Documents identified in this Section shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations. In the absence of individual signatures by Owner and Contractor, the Contract Documents identified in the signed contract prevail.

§ 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. After execution of the Original Contract Documents, the Contract may thereafter be amended or modified only by a written Modification. 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.

§ 1.1.3 The Work

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.

§ 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

Instruments of Service are 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 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 The terms "bids" or "bidding" shall include any kind of competitive purchasing under the Texas Education Code Chapter 44 and Texas Government Code Chapter 2269.

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§ 1.1.10 MISCELLANEOUS OTHER WORDS

§ 1.1.10.1 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 special events.

§ 1.1.10.2 CALENDAR DAY

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

§ 1.1.10.3 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.

§ 1.1.10.4 WORK DAY

Work days include all calendar days except Holidays, Saturdays and Sundays.

§ 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 included in the cost of the Work the greater quantity or better quality, or the most stringent requirements, unless Contractor shall have obtained, before the submission of Contractor's Proposal, an interpretation in writing from the Architect as to what shall govern. The Architect, in case of such conflict, may interpret or construe the document 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 interests 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 PRECEDENCE OF THE CONTRACT DOCUMENTS

The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

- .1 Contract Modifications signed by Contractor and Owner.
- .2 Addenda, with those of later date having precedence over those of earlier date.
- .3 General Conditions - AIA Document A201-2017, as modified by the Owner for the Project.
- .4 Specifications and Drawings.
- .5 Agreement – AIA Document A101-2017, as modified by the Owner for the Project.

§ 1.2.5 RELATION OF SPECIFICATIONS AND DRAWINGS

Specifications and Drawings are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.6 Where, in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are given, 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 such substitution has been specifically accepted for use on this Project by the Architect.

§ 1.2.7 When the Work is governed by reference to standards, building codes, manufacturer's instructions, or other documents, unless otherwise specified, the current edition as of the Agreement date shall apply.

§ 1.2.8 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

§ 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. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. 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 the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 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. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service 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.

§ 1.6 Notice

§ 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.

§ 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.

(Paragraphs deleted)

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the Board of Trustees of the Midlothian Independent School District and is referred to throughout the Contract Documents as if singular in number. The Owner may designate in writing one or more

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persons to represent the Owner; however, such representatives shall have the authority to bind the Owner only to the extent expressly authorized by the Owner and shall have no implied authority. Except as otherwise provided in Section 4.2.1, the Architect does not have the authority to bind the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner may engage a third-party consultant to represent the Owner. The Owner will notify the Contractor of the identity of such consultant.

§ 2.1.3 The Contractor acknowledges that no lien rights exist with respect to public property.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Pursuant to the requirements of Texas Business and Commerce Code section 56.054(e)(3), the Owner represents that funds are available and have been authorized for the full contract amount of the Work .

§ 2.2.2 [Paragraph Deleted.]

§ 2.2.3 [Paragraph Deleted.]

§ 2.2.4 [Paragraph Deleted.]

§ 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 whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 If any surveys are needed outside what is shown in the Contract Documents, the Contractor shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

§ 2.3.5 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner within a reasonable time following actual receipt of a written request.

§ 2.3.6 The Contractor, Owner and Architect shall agree on an appropriate quantity of drawings and specifications to be printed and distributed for bidding purposes. The drawings shall be provided by the Architect and paid for by the Owner.

§ 2.3.7 Owner's personnel may, but are not required to be present at the construction site during progress of the Work to assist the Architect in the performance of his duties, and to verify the Contractor's record of the number of workmen employed on the Work, their occupational classification, the time each is engaged in the Work, and the equipment used in the performance of the Work for purpose of verification of Contractor's Applications for Payment.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work nonconforming or defective Work as required by Section 12.2, or fails to complete the Work on time as required by Article 3 of the Agreement or is in default of any of its material obligations hereunder, the Owner, by a written order signed by an agent specifically so empowered by the Owner, may order 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 any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. This right shall be in addition to, and not in restriction of, the Owner's right under Section 12.2.

§ 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 three-day period after receipt of 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. The Architect or Owner may, 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 additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, 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, 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.

§ 3.1.2 The Contractor shall perform the Work in a good and workmanlike manner except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship.

§ 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 Owner or Owner's consultants, if applicable, conducted in accordance with the Contract Documents or activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 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 and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including without limitation: (1) the location, condition, layout 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. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site, or for price escalations in the marketplace. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section.

§ 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.

- .1 The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the Work installed by other contractors, is not guaranteed by the Architect or the Owner.
- .2 The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other Work, it shall verify at the site all dimensions relating to such existing or other Work. Any errors due to the Contractor's

failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 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 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. If the Contractor performs those obligations, 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.

§ 3.2.5 Notwithstanding the delivery of a survey or other documents by the Owner, Contractor shall use reasonable efforts to perform all Work in such a manner so as to avoid damaging any utility lines, cables, pipes, or pipelines on the property. Contractor shall be responsible for, and shall repair at Contractor's own expense, any damage done to lines, cables, pipes, and pipelines identified to Contractor.

§ 3.2.6 The Owner and Contractor agree that the Contract Documents may not be free from errors, inconsistencies, or omissions, and further agree that the Owner makes no warranty as to the completeness or accuracy of the Contract documents, either express or implied. Execution of the Contract by the Contractor is a representation that the Contractor has thoroughly reviewed and become familiar with the Contract Documents and that the Contractor is not aware of any errors, inconsistencies or omissions in the Contract Documents which would delay the Contractor in the performance of the Contract Work. The Contractor shall not be entitled to any damages or increase in the Contract Amount due to delays or disruptions to the Work. This limitation on damages is further subject to the limitations set forth in Section 15.1.7.

§ 3.2.7 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 request for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.8 The Contractor shall use the AIA Document G716-2004 "REQUEST FOR INFORMATION" (RFI) form unless otherwise provided in the Contract Documents. The Contractor shall keep a log of all RFI's submitted and number the RFI's consecutively beginning with the number 1.

§ 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 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 to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.1.1 The Contractor shall assign a superintendent who shall make decisions in behalf of the Contractor and its Subcontractors. The superintendent shall be on the Project, in this capacity, at all times while Work on the Project is in progress.

§ 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.

§ 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 Contractor shall bear responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, chapter C, Sections 756.021, *et seq.*

§ 3.3.5 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable herefrom 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 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 as described herein.

§ 3.3.6 The Contractor shall review contractor 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 Section 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 Contractor acknowledges that the Work may be performed in connection with an educational facility which is currently occupied and in use. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb, or disrupt Owner's normal operations or facilities. Contractor agrees to and shall comply with all rules, regulations and requirements of the Owner and the school campus on which the Work is to be performed, and shall take all steps necessary to protect and guard the safety of the employees, students and invitees of Owner. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working in an existing facility and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum. The Contractor shall perform all the Work in such a manner as to cause minimum interference with the operations of the Owner and other contractors and Subcontractors on the site, and shall take, and cause the Contractor's and its Subcontractor's employees, agents, licensees and permittees to take all necessary precautions to protect the Work and the site and all persons and property thereon from damage or injury.

§ 3.3.8 Representatives of the Owner, Contractor, and Architect shall 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.

§ 3.3.9 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.

§ 3.3.10 In the event Contractor shall fall behind schedule at any time, for any reason, Owner shall be entitled to direct acceleration or resequencing of the Work to bring the Work back on schedule. In the event Contractor determines that the Scheduled Completion Date cannot be met by resequencing the Work, then Contractor shall immediately provide to the Owner, and in any event within seven (7) days after the date of receipt of any request by Owner for resequencing or acceleration, a plan to complete the Work in the shortest possible time. No approval by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor pursuant to this paragraph 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 Scheduled Completion Date.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, 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. The Owner shall pay fees for public or private water, gas, electrical and other utility service at the site. The Contractor shall secure and arrange for all necessary utility connections.

(Paragraph deleted)

§ 3.4.1.1 PREVAILING WAGES

The Project is subject to the Texas Government Code, Chapter 2258, Prevailing Wage Rates. This statute requires the Contractor and any Subcontractor to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

§ 3.4.1.2 In accordance therewith, the Owner has established a scale of prevailing wages which is incorporated in the Project specifications, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the Work at the time of construction.

§ 3.4.1.3 A Contractor or Subcontractor who violates the provisions of Sections 3.4.1.1 or 3.4.1.2 shall pay to Owner the sum of Sixty Dollars and No/100 (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rate stipulated in the scale of prevailing wages applicable to this Project, as required by Texas Government Code Section 2258.023(b).

§ 3.4.2.1 Substitutions and alternates may be rejected 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; and (iii) when in the judgment of the Owner or 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 and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other information necessary for a complete evaluation of the substitution; (ii) a written explanation of the reasons the substitution is necessary, 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 the (a) the proposed substitution confirms to and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings, and (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitutions shall be submitted in triplicate to the Architect in sufficient time to allow the Architect no less than twenty-one (21) working days for review. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

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

§ 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 shall be responsible for the actions of Contractor's forces, Subcontractor's forces and all tiers of Sub-subcontractor's forces. The Contractor recognizes that the Project Site is a public-school campus, and will prohibit the possession or use of alcohol, controlled stances, tobacco, and any prohibited weapons on the Project Site and shall require adequate dress of the Contractor's forces consistent with the nature of the Work being performed, including wearing shirts at all times. Sexual harassment of employees of the Contractor or employees or students of the Owner by employees of the Contractor is strictly forbidden. Any employee of the Contractor who is found to have engaged in such conduct shall be subject to appropriate disciplinary action by the Contractor, including removal from the job site.

§ 3.4.4 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project.

§ 3.4.5 CRIMINAL HISTORY RECORDS CHECKS

§ 3.4.5.1 For purposes of this Section 3.4.5 (and all subsections) the following definitions shall be applicable:

- .1 "Continuing Duties" shall mean work duties that are performed pursuant to a contract on a regular, repeated basis rather than infrequently or one-time only.
- .2 "Covered Employees", shall mean, all employees of Contractor, as well as employees of Contractor's subcontractors, consultants or independent contractors (of every tier), who will have Continuing Duties related to the services contracted for herein and the Opportunity For Direct Contact With Students in connection with the subject employee's Continuing Duties.
- .3 "Disqualifying Criminal History" means: a conviction within the last 30 years, related to one or more 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: (1) a felony offense under Texas Penal Code Title 5 Offenses Against Persons (homicide; kidnapping, unlawful restraint, smuggling of persons, trafficking of persons, sexual offenses; and assault offenses); (2) an offense for which a defendant is required to register as a sex offender under Texas Code of Criminal Procedure Chapter 62; or (3) an equivalent offense under federal law or the laws of another state. Contractor shall assume all expenses associated with obtaining criminal history record information, providing the certification, and performing Contractor's responsibilities as set out herein.
- .4 "Opportunity For Direct Contact With Students" is contact that results from activities that provide a substantial opportunity for verbal or physical interaction with students, and that is not supervised by a certified educator or other professional district employee. An employee is not considered to have an Opportunity For Direct Contact With Students if: (1) the employee's work does not involve the construction alteration or repair of an Instructional Facility; (2) the employee's work involves construction of a new Instructional Facility and the person's duties related to the contacted services will be completed not later than the seventh day before the first date the facility will be used for instructional purposes; or (3) if the employee's work involves an existing Instructional Facility and:
 - a. the project site area contains sanitary facilities and is separated from all areas used by students, by a secure barrier fence that is not less than six feet in height; and
 - b. the Contractor has adopted a written policy applicable to its employees, as well as employees of its subcontractors (of any tier) and its independent contractors and consultants, which prohibits these parties from interacting with students or entering areas used by students, informs these parties of the policy, and enforces the policy on the Project site and at any other areas where the Work of this Contract will be conducted.
 - c. the Contractor has sought and received written approval by the District of the adopted policy (including its enforcement provisions) and Contractor's its means of informing the relevant parties of the existence of the policy.
 - d. Contractor certifies that, if it has taken the above precautions or imposed conditions to ensure that the Contractor's employees and employees of any of its subcontractors, independent contractors, or consultants, will not become Covered Employees, then Contractor will make reasonable efforts to ensure that these precautions or conditions continue throughout the time the contracted services are provided.
- .5 "Instructional Facility" is defined as real property or improvements to real property, or a necessary fixture of an improvement to real property that is used predominantly for teaching the curriculum

required under Texas Education Code § 28.002; Texas Education Code § 22.08341(a)(2); and Texas Education Code § 46.01.

§ 3.4.5.2 Pursuant to Texas Education Code §22.08341, Contractor shall obtain criminal history record information through the Fingerprint-Based Applicant Clearinghouse of Texas ("FACT Clearinghouse"), for all of Contractor's Covered Employees. To the extent, Contractor does not have a direct contractual connection with a lower-tier subcontractor, Contractor shall require its subcontractor, independent contractors, and consultants, by the terms of their respective contract with Contractor, to obtain the required criminal history record information through the FACT Clearinghouse, for their Covered Employees, and that such subcontractors, independent contractors, and consultants of Contractors subcontractors, require their subcontractors, independent contractors, and consultants of every tier, to timely make the same certifications to the Contractor as those required by the Owner from the Contractor herein, in order to allow Contractor to timely provide the certifications to the Owner required by the following paragraph, pursuant to Texas Education Code §22.08341. If Contractor is required by this subsection to obtain criminal history record information through the FACT Clearinghouse, then Contractor will subscribe the FACT Clearinghouse for purposes of receiving updates to the criminal history record information it obtained and shall require the same of its lower-tier subcontractors, independent contractors and consultants, by contract.

§ 3.4.5.3 If Covered Employees will be working on the Project, before beginning any Work on the Project, Contractor will provide written certification to the Owner that Contractor that the criminal history review requirements for all Covered Employees working on the Owner's Project have been satisfied, and specifically that Contractor:

- .1 has obtained the required criminal history record information through the FACT Clearinghouse for its Covered Employees;
- .2 has obtained written certification from its subcontractors independent contractors, and consultants (of any tier) that they have obtained the required criminal histories documentation through the FACT Clearinghouse for the subcontractor's, independent contractors', and consultants' Covered Employees; that the criminal history review requirements for all Covered Employees working on the Owner's Project have been satisfied; that either none of their respective Covered Employees had a Disqualifying Criminal History, or if a Covered Employee had a Disqualifying Criminal History they have been excluded from assignment to the Project; and that if the subcontractor, independent contractor, or consultant receives information during the performance of this Contract that one of its Covered Employees associated with the Work of this Contract, is subsequently reported to have a Disqualifying Criminal History or offense, it will immediately remove the Covered Employee from the project site or any other District Property where the Work of this Contract will be conducted and notify the Contractor in writing within three (3) business days;
- .3 will not assign or permit Covered Employees (of either Contractor or any of its subcontractors, independent contractors, or consultants) with a Disqualifying Criminal History to performing any work on Owner's project or on Owner's property where the Work of this Contract will be conducted;
- .4 if Contractor receives information during the performance of this Contract that a Covered Employee associated with the Work of this Contract, is subsequently reported to have a Disqualifying Criminal History or offense, it will immediately remove the Covered Employee from the project site or any other District Property where the Work of this Contract will be conducted and notify the Owner in writing within three (3) business days; and
5. if any employee associated with the work under this Contract is not a Covered Employee will make a reasonable effort to ensure that the reasons the employee is determined not to be a Covered Employee will continue to exist throughout the time the contracted services are provided.

§ 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. 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, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 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.

§ 3.5.3 The Contractor agrees to assign to the Owner at the Time of Final Completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties. As a condition precedent to final payment, the Contractor shall submit to Owner a complete set of warranties from contractors, manufacturers, or suppliers as appropriate, and executed by Contractor as required, with a warranty commencement date as required by the Contract Documents.

§ 3.5.4 Contractor's express warranty herein shall be in addition to, and not in lieu of, any other remedies Owner may have under this Agreement, at law, or in equity for defective Work.

§ 3.5.5 The warranties provided in Section 3.5 shall be in addition to and not in limitation of any other warranty or remedy required by law or by the Contract Documents, and such warranty shall be interpreted to require Contractor to replace defective materials and equipment and re-execute defective Work which is disclosed to the Contractor by the Owner within a period of one (1) year after Substantial Completion of the entire Work or if latent defect, within one (1) year after discovery thereof by Owner.

§ 3.5.6 The Contractor shall issue in writing to the Owner as a condition precedent to final payment a "General Warranty" reflecting the terms and conditions of Sections 3.5.2 and 3.5.3 for all Work under the Contract Documents. This General Warranty shall be assignable. Submittal of all warranties and guarantees are required as a prerequisite to the final payment.

§ 3.5.7 Except when a longer warranty time is specifically called for in the Specification Sections or is otherwise provided by law, the General Warranty shall be for twelve (12) months and shall be in form and content otherwise satisfactory to the Owner. Contractor acknowledges that the Project may involve construction work on more than one (1) building for the Owner. Each building, or approved phase of each building, may have its own, separate, and independent date of Substantial Completion or Final Completion. Contractor shall maintain a complete and accurate schedule of the dates of Substantial Completion, dates upon which the one (1) year warranty on each phase or building which is substantially complete will expire, and dates of Final Completion. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one (1) month prior to the expiration of the one (1) year warranty period on each building or each phase of the building which has been substantially completed. Prior to termination of the one (1) year warranty period, Contractor shall accompany the Owner and Architect on reinspection of the building and be responsible for correcting any reasonable additional deficiencies not caused by the Owner or by the use of the building which are observed or reported during the reinspection. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within three (3) days of initial notification from Owner. Contractor shall prosecute the Work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period. If Contractor fails to provide notice of the expiration of the one (1) year warranty period at least one (1) month prior to the expiration date, Contractor's warranty obligations described in this Section shall continue until such inspection is conducted and any deficiencies found in the inspection corrected.

§ 3.5.8 Warranties shall become effective on a date established by the Owner and Architect in accordance with the Contract Documents. This date shall be the date of Substantial Completion of the entire Work, unless otherwise provided in any Certificate of Partial Substantial Completion approved by the parties, except for Work to be completed or corrected after the date of Substantial Completion and prior to final payment. Warranties for Work to be completed or corrected after the date of Substantial Completion and prior to final payment shall become effective on the later of the date the Work is completed or corrected and accepted by the Owner and Architect or the date of final payment.

§ 3.6 Taxes

The Contractor not include in the Contract Price or any Modification any amount for sales, use, or similar taxes for which (1) a Texas independent school district is exempt, and (2) the Owner has provided the Contractor with a tax exemption certificate or other documentation necessary to establish the Owner's exemption from such taxes.

§ 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.

§ 3.7.2 In performing its obligations hereunder, the Contractor shall fully comply with all applicable laws, ordinances, rules, regulations, lawful orders and decrees of all applicable authorities, and when requested shall furnish evidence satisfactory to the owner of such compliance.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction. The Contractor agrees to indemnify, defend and hold harmless the Owner, its trustees, officers, representatives, agents and employees from and against all claims, fines, penalties, or liabilities from or arising out of such Work, or based upon the actual or asserted violation of any laws, ordinances, rules, regulations, orders or decrees applicable to such Work.

(Paragraphs deleted)

§ 3.7.4 Concealed or Unknown Conditions. Claims for Concealed or Unknown Conditions.

Contractor acknowledges that there may exist at the Project site certain soil and geological conditions and/or surface physical conditions which are not disclosed in the Contract Documents, and which have been known to or may be reasonably anticipated to occur in the area or be related to any past use of the Project site, including, without limitation, the presence of rock and its hardness, geologic formations, differing soils, and surface structures, equipment or other impediments, either natural or man-made (collectively, "Subsurface Conditions"). Owner makes no representations or warranties regarding Subsurface Conditions at the Project site, or of the accuracy or continuity of conditions which may be noted in any reports furnished or made available to Contractor. Contractor covenants and agrees that any such reports are furnished or made available by Owner to Contractor for information purposes only, and Contractor acknowledges that Owner is not responsible for the content thereof. Contractor shall be responsible for inspecting the site and determining the existence or likelihood of any Subsurface Conditions which may affect the Contract Time or the Contract sum, or both. The Contract Time and the Contract Sum bid by Contractor shall be deemed to include all costs of and time to complete all Work associated with or attributable to Subsurface Conditions, and Contractor shall not be entitled to submit a claim for or to obtain an extension of the Contract Time or increase in the Contract Sum due to the existence of Subsurface Conditions. Except as provided above with respect to Subsurface Conditions, if conditions are encountered at the site which are concealed physical conditions which were not known to the Contractor and which differ substantially from those indicated in the Contract Documents, then the Contractor shall notify the Owner and the Architect of such conditions promptly before conditions are disturbed, and in no event less than three (3) days after first observation of the conditions. The Architect will promptly investigate such conditions and report its findings to the Owner. If the Owner and the Contractor cannot agree on an adjustment to the Contract Sum or Contract Time, the adjustment shall be subject to mediation pursuant to 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. 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 Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 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. Contractor's obligations under this Section do not require it to perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites. However, any drainage alterations made by Contractor during the construction process which require the issuance of a permit shall be at Contractor's sole cost.

§ 3.7.7 The Contractor shall certify in writing that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by Local/State 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 Instruments of Service related to Contract Closeout.

§ 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.

§ 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 shall be adjusted accordingly by Change Order. The amount of the 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 within such time as is reasonably specified by the Contractor as necessary to avoid delay in the Work.

§ 3.8.4 When performing Work under allowances, where reasonably possible, Contractor shall solicit and receive no fewer than three (3) written proposals and shall provide the Work as directed by the Architect, upon Owner's written approval, on the basis of the best value for the Owner.

§ 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 during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall not replace the Superintendent prior to Final Completion of the Work unless (1) the Superintendent shall cease to be employed by the Contractor or its subsidiaries or affiliated companies, or (2) the Owner agrees to such replacement. The Superintendent may not be employed on any other project prior to Final Completion of the Work. From Substantial Completion to Final Completion, the Superintendent shall be on-site as necessary to ensure that Final Completion occurs within thirty (30) days of Substantial Completion.

§ 3.9.2 Contractor shall furnish a list to the Architect of all engineers, consultants, job-site superintendents, Subcontractors and suppliers involved in construction. The Architect shall provide such information to the Owner.

- .1 The Owner may reject or require removal of any engineer, consultant, job superintendent, or employee of the Contractor, Subcontractor or Sub-subcontractor involved in the Project.
- .2 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 The Owner reserves the right to utilize one or more of its employees to function in the capacity of the Owner's inspector, whose primary function will be daily inspections, checking pay requests, construction timelines, and storage of supplies and materials.

§ 3.9.3 The Owner shall be notified not less than twenty-four (24) hours before any time that superintendent will not be present at the site for any reason except 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, the Contractor is subject to being back charged in the amount of TWO HUNDRED FIFTY AND NO/100 DOLLARS (\$250.00) for each 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 initial constructions schedule for the Work utilizing critical path method scheduling techniques. The initial schedule shall not exceed the time limits set forth in the Contract Documents. The initial schedule shall thereafter be updated on a monthly basis and submitted with each application for payment. The receipt of an updated schedule with each application for payment shall be a condition precedent to the Owner's duty to make any payment pursuant to Article 9.6.

- .1 Each schedule shall break the Work into a sufficient number of activities to facilitate the efficient use of critical path method scheduling by the Contractor, Owner, and Architect. Each schedule activity shall be assigned a cost value consistent with the Schedule of Values so as to allow the Owner and Contractor to project cash flow for the Project.
- .2 Each schedule shall include activities representing manufacturing, fabrication, or ordering lead time for materials, equipment, or other items for which the Architect is required to review submittals, shop drawings, product data, or samples.
- .3 Each schedule, other than the initial schedule, shall indicate the activities, or portions thereof, which have been completed; shall reflect the actual time for completion of such activities; and shall reflect any changes to the sequence or planned duration of all activities.
- .4 If any updated schedule exceeds the time limits set forth in the Contract Documents for completion of the Work, the Contractor shall include with the updated schedule a statement of the reasons for the anticipated delay in completion of the Work and the Contractor's planned course of action for completing the Work within the time limits set forth in the Contract Documents. If the Contractor asserts that the failure of the Owner or the Architect to provide information to the Contractor is the reason for anticipated delay in completion, the Contractor shall also specify what information is required from the Owner or Architect.
- .5 Neither the Owner or the Contractor shall have exclusive ownership of float time in the schedule, and all float time shall inure to the benefit of the Project. The Contractor agrees to use its best efforts not to sequence the Work or assign activity durations so as to produce a schedule in which more than one-fourth of the remaining activities have no float time.
- .6 Submission of any schedule under this Contract constitutes a representation by the Contractor that: (1) the schedule represents the sequence in which the Contractor intends to prosecute the remaining Work; (2) the schedule represents the actual sequence and durations used to prosecute the completed Work; (3) that to the best of its knowledge and belief the Contractor is able to complete the remaining Work in the sequence and time indicated; and, (4) that the Contractor intends to complete the remaining Work in the sequence and time indicated.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall 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 Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.4 In the event the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take

corrective measures necessary to expedite the progress of construction, including, without limitations, (i) working additional shifts of overtime, (ii) supplying additional manpower, equipment and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

- .1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subparagraph 3.10.5.
- .2 The Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.5 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.5 If reasonably required by Owner, Contractor shall also prepare and furnish project cash flow projections, manning data for critical activities, and schedules for the purchase and delivery of all critical equipment and material, together with periodic updating thereof.

§ 3.10.6 The Contractor shall recommend to the Owner and to the Architect a schedule for procurement of long-lead time items which will constitute part of the Work as required to meet the Project schedule. If such long-lead time items are procured by the Owner, they shall be procured on terms and conditions as recommended by the Contractor. Upon the Owner's acceptance of the Contractor's Stipulated Sum proposal, all contracts previously entered into by Owner shall be assigned by Owner to the Contractor who shall accept responsibility for such contracts as if it had initially entered into such contracts. Contractor shall expedite the delivery of long-lead time items. The Contractor shall receive and protect all Owner supplied material.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, 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, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.1 Contractor shall make available, at the Project site, job records, including, but not limited to, invoices, payment records, payroll records, daily reports, logs, diaries, and job meeting minutes, applicable to the Project. Contractor shall make such reports and records available to inspection by the Owner, Architect, or their respective agents.

§ 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.

§ 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 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 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 not be responsible for the adequacy of the performance and design criteria specified 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 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.

§ 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.

§ 3.12.10.3 The Architect's review of Contractor's submittals will be limited to one examination of an initial submittal and one (1) examination of a resubmittal. 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 deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

§ 3.13 Use of Site

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. The Contractor shall so conduct its operations as not to unreasonably interfere with traffic on public thoroughfares adjacent or near to the Project site.

§ 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. 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.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract and shall, not less than two times each week, clean up by removing rubbish, including old and surplus materials. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials, and shall clean, sweep, mop, brush and polish, as appropriate, the interior of the improvements or renovated areas, including but not limited to, any floors, carpeting, ducts, fixtures, and ventilation units operated during construction. Contractor shall clean exterior gutters, drainage, walkways, driveways and roofs of debris.

§ 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 damaged or broken glass, and at completion of the Work, shall replace such damaged or broken glass.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.16.1 Upon request of the Architect or Owner, the Contractor shall accompany the Architect or Owner on an inspection 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 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, CONTRACTOR WAIVES AND RELEASES ALL CLAIMS AGAINST AND SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER, OWNER'S CONSULTANTS, THE ARCHITECT, THE ARCHITECT'S CONSULTANTS, AND THEIR RESPECTIVE AGENTS AND EMPLOYEES FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING ATTORNEY'S FEES, ARISING OUT OF, OR RESULTING FROM THE PERFORMANCE OF THE WORK, PROVIDED THAT ANY SUCH CLAIM, DAMAGE, LOSS OR EXPENSE: (1) IS ATTRIBUTABLE TO BODILY OR PERSONAL INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF) INCLUDING THE LOSS OF USE RESULTING THEREFROM, AND (2) IS CAUSED IN

WHOLE OR IN PART BY ANY WILLFUL OR NEGLIGENT ACT OR OMISSION OF THE CONTRACTOR, ANY SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT CAUSED IN PART BY THE NEGLIGENT ACTS OR OMISSIONS OF OWNER, OWNER'S CONSULTANTS, THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS, WHERE THAT NEGLIGENCE IS A CONCURRING CAUSE OF THE INJURY, DEATH, OR DAMAGE. HOWEVER, THE INDEMNITY PROVIDED FOR IN THIS SECTION SHALL HAVE NO APPLICATION TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, OR LIABILITY WHERE THE INJURY, DEATH, OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS UNMIXED WITH THE FAULT OF ANY OTHER PERSON OR ENTITY; PROVIDED THAT WHERE THE NEGLIGENCE OF OWNER, OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.

§ 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 ACT OR INSURANCE, DISABILITY ACTS OR INSURANCE OR OTHER EMPLOYEE BENEFIT ACTS OR RELATED INSURANCE.

§ 3.18.3 CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL HOLD OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO CONTRACTOR'S OR ITS SUBCONTRACTORS' CONSTRUCTION TOOLS AND EQUIPMENT AND RENTED ITEMS WHICH ARE USED OR INTENDED FOR USE IN PERFORMING THE WORK, REGARDLESS OF WHETHER SUCH LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OF OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS. THIS PROVISION SHALL APPLY, WITHOUT LIMITATION, TO LOSS OR DAMAGE OCCURRING AT THE WORK SITE OR WHILE SUCH ITEMS ARE IN TRANSIT TO OR FROM THE WORK SITE AND IS IN ADDITION TO CONTRACTOR'S OBLIGATIONS UNDER SECTION 3.18.1. IT IS THE EXPRESS INTENTION OF THE PARTIES HERETO, BOTH CONTRACTOR AND OWNER, THAT THE INDEMNITY IS PROVIDED FOR IN THIS SECTION AS TO CONTRACTOR'S OR ITS SUBCONTRACTOR'S TOOLS AND EQUIPMENT AND RENTAL ITEMS, IS AN AGREEMENT BY CONTRACTOR TO INDEMNIFY AND PROTECT OWNER FROM THE CONSEQUENCES OF OWNER'S OWN NEGLIGENCE, AND THAT OF OWNER'S CONSULTANTS, THE ARCHITECT AND ARCHITECT'S CONSULTANTS WHETHER THAT NEGLIGENCE IS THE SOLE OR CONCURRING CAUSE OF THE LOSS OR DAMAGE. PROVIDED HOWEVER, THAT WHERE THE NEGLIGENCE OF OWNER OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.

§ 3.18.4 Indemnification hereunder shall include, without limiting the generality of the foregoing, liability which could arise to the Owner, its agents, consultants, and representatives or the Architect pursuant to State statutes for the safety of workmen and in addition, all Federal statutes and rules existing thereunder for protection, occupational safety and health to workmen. It being agreed that the primary obligation of the Contractor is to comply with said statutes in performance of the Work by Contractor and that the obligations of the Owner, its agents, consultants, and representatives under said statutes are secondary to that of the Contractor.

§ 3.18.5 THE PROVISIONS OF ARTICLE 3.18 IN ITS ENTIRETY SHALL SURVIVE THE COMPLETION, TERMINATION OR EXPIRATION OF THIS CONTRACT.

§ 3.19 REPRESENTATIONS AND WARRANTIES

§ 3.19.1 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 plant, tools, materials, supplies, equipment and labor required to 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 and public quasi-public authorities having jurisdiction over it and over the Work and the site of the Project;
- .4 that the execution of the Contract and its performance thereof is within its duly authorized powers; and
- .5 that its duly authorized representative has visited the site of the Work, familiarized itself with the local conditions under which the Work is to be performed and correlated its observations with the requirements of the Contract Documents.

§ 3.20 BUSINESS STANDARDS

§ 3.20.1 Contractor, in performing its obligations under Contract, shall establish and maintain appropriate business standards, procedures, and controls, including those necessary to avoid any real or apparent impropriety or adverse impact on the interest of Owner or affiliates. Contractor shall review, with Owner, at a reasonable frequency during the performance of the Work hereunder, such business standards and procedures including, without limitation, those related to the activities of Contractor's employees and agents in their relations with Owner's employees, agents, and representatives, vendors, Subcontractors, and other third parties, and those relating to the placement and administration of purchase orders and contracts.

§ 3.21 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 [Paragraph Deleted.]

§ 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 Owner's contract with the Architect terminates. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 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.

§ 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.

§ 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. 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 Based 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 or the Owner has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect or the Owner considers it necessary or advisable, the Architect or the Owner will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect or the Owner 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. Certain portions of the Work will be tested and/or observed at various stages, sometimes off the Project site, between initial observation or review and final positioning of the completed Work. Nothing in any initial or prior approval or test result shall govern if at any subsequent time the Work or any portion thereof is found not to conform to the requirements of the Contract Documents.

§ 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 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 reasonable promptness 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 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 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 Contract Documents, the 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, so as to keep from delaying the Work or the activities of the Owner, Contractor or other Contractors.

§ 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.

§ 4.2.9 The Architect and the Owner 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 Upon written request of the Owner or Contractor, the Architect will issue its interpretation of the requirements of the plans and specifications. 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 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.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents and not expressly overruled in writing by the Owner.

§ 4.2.14 The Architect will review and respond to requests for information about 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 expense to the Owner.

§ 4.2.15 The Architect may appoint an employee or other person to assist the Architect during the construction. These representatives will be instructed to assist the Contractor in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's Representative may have allowed Work not in accordance with the Contract Documents shall not prevent the Architect from insisting that the faulty Work be corrected to conform to the Contract Documents and the Contractor shall correct same.

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 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 notify 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.

§ 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 Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall 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.

§ 5.3 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. 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.

§ 5.3.1 Neither the Owner nor the Architect shall be obligated to pay or to insure the payment of any monies to Subcontractors or vendors by the Contractor.

§ 5.3.2 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 contract. 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 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 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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 such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation may, in the Owner's sole discretion, be equitably adjusted for increases in cost resulting from the suspension.

§ 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.

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.

§ 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 shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, 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. 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 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage 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.

§ 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 the Architect 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. Failure of the Contractor to notify the Architect 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 to receive the Contractor's Work.

§ 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.

§ 6.2.4 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 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.

§ 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. 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.

§ 7.1.4 On Change Orders and Construction Change Directives, the total Contractor mark-up for overhead and profit included in the total cost to the Owner shall be based upon the following schedule:

- .1 For the Contractor, for Work performed by the Contractor's own forces, ten percent (10%) of the cost (0% for change orders to be paid out of any contingency allowance).

- .2 For the Contractor, for the Work performed by the Contractor's Subcontractors, four percent (4%) of the amount due the Subcontractors (0% for the change orders to be paid out of any contingency allowance).
- .3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, ten percent (10%) of the cost.
- .4 The costs to which the above percentages shall be applied will be determined in accordance with Section 7.3.7.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including quantities and unit costs of labor and materials extended and totaled.

§ 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; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Acceptance of a disbursement from any allowance fund, contingency fund or acceptance of a Change Order by the Contractor shall constitute full accord and satisfaction for any and all claims, whether direct or indirect, including but not limited to impact, delay or acceleration damages, arising from the subject matter of the disbursement or Change Order.

§ 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 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 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, 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;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of 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 Section 7.1.4. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect and the Owner 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 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and applicable sales, use, or similar taxes, directly related to the change; and

- .5 Costs of supervision and field office personnel directly attributable to the change only if the adjustment causes an extension of the Contract Time.

§ 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 Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum 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 overhead and profit as set forth in Section 7.1.4. 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

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum 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 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 Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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 Completion of the Work.

§ 8.1.2 The date of commencement of the Work shall be the first business day following the Contractor's written notice to proceed. The notice to proceed shall not be issued until the Agreement has been signed by the Contractor and the Owner, the Owner and Architect have received and approved as to form all required payment and performance bonds and insurance as required by Article 11.

(Paragraph deleted)

§ 8.1.3.1 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.3.2 The date of Final Completion is the date certified by the Architect in accordance with Section 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than thirty (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 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. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.2.4 In the event Substantial Completion is not achieved by the designated date, or as it may be extended, Owner may withhold payment of any further sums due until Substantial Completion is achieved. Owner shall also be entitled to deduct out of any sums due to Contractor any or all liquidated damages due Owner in accordance with the Contract Documents.

§ 8.2.5 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: FIVE HUNDRED AND NO/100 DOLLARS (\$500.00).

§ 8.2.6 If one or more of the Liquidated Damages provisions set out in the Agreement are held to be legally unenforceable as a penalty (except when the holding is the result of a challenge by the Owner), the Owner shall be allowed to recover actual damages caused by the Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.2.7 In addition to Liquidated Damages, if any, the Contractor shall reimburse the Owner for any Supplemental or Additional Services of the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor or caused by Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 The Owner, except as provided for in this Section 8.3.1, shall not be liable to the Contractor for delay to the Contractor's Work by the act, neglect or default of the Owner or the Architect, or by reason of fire, act of God, riot, strike, action of workmen or others, or any cause beyond the Owner's control. Should the Owner or Architect delay the Contractor in the Work, Contractor shall receive an extension of time for completion equal to the delay if a written claim is made within forty-eight (48) hours, and under no circumstances shall the Owner be liable to pay the Contractor any compensation for such Owner-caused delays.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Agreement does not permit recovery of damages for delay by the Contractor for delay, disruption or acceleration. Contractor agrees that Contractor shall be fully compensated for all delays solely by 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. All costs of overtime Work required by the Contract Time and the nature of the Work, as set forth in or inferable from the Contract Documents, except costs of emergencies covered in Section 10.4, shall be and are included in the Contract.

§ 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 shall be equitably adjusted.

§ 9.2 Schedule of Values

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 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 or the Owner, 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.

§ 9.3 Applications for Payment

§ 9.3.1 In accordance with the requirements of Section 5.1.3 of the Agreement, 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 require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703-1992, Continuation Sheet.

§ 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.

§ 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 a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Contractor agrees that, for purposes of Texas Government Code section 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 Architect's Certificate for Payment shall be construed as a receipt of an invoice by the Owner, for purposes of Texas Government Code section 2251.042.

§ 9.3.2 Except as otherwise agreed in writing, executed by the Owner and Contractor prior to delivery of material and equipment, the Contractor is not entitled to payment for material and equipment delivered and stored on site or off site. The Owner may, in the Owner's sole discretion, agree to make payment for materials stored on site or off site and may, as a condition precedent to the grant of such consent, establish reasonable procedures and requirements (including provision of additional insurance at Contractor's sole expense) with which Contractor must comply.

§ 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 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 In each Request for Payment, Contractor shall certify that there are no known mechanics' or materialmen's liens outstanding at the date of this requisition, 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 application and that except for such bills not paid but so

included, there is no known basis for the filing of any mechanics' or materialmen's liens on the Work, and that releases from all contractors 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 theretofore performed and for which payment has been made by Owner to Contractor.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) 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) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner 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 of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 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, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, 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. 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 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.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect or the Owner 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;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents;
- .8 delay beyond the times set forth elsewhere in the Contract Documents including but not limited to the submission for approval of the schedule of values, cost breakdowns on proposal requests, progress schedule, list of Subcontractors and insurance requirements;
- .9 evidence of financial inability to perform the Contract fully;
- .10 failure to submit record documents required by the Contract; or
- .11 failure of the Contractor to perform any other obligations of the Contract.

§ 9.5.2 If the Contractor disputes the Architect's or the Owner's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, 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. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1.

§ 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.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued and the Owner has approved a Certificate for Payment, the Owner shall make payment of disputed amounts in the manner and within the time provided in the Contract Documents, and shall so notify the Architect. Owner shall notify Contractor within twenty-one (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, within ten (10) days following receipt of payment from the Owner, pay all undisputed bills for labor and materials performed and furnished by others in connection with the construction, furnished and equipping of the improvements and the performance of the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this contract. Contractor shall include a provision in each of its contracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder. 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, the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.

§ 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.

§ 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 The Contractor shall, as a condition precedent to any obligation of the Owner under the Contract Documents, provide to the Owner payment and performance bonds in the full penal amount of the Contract in accordance with Texas Government Code Chapter 2253.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, 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.

§ 9.7 Failure of Payment

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 if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect and approved by the Owner or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the 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.

§ 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; provided, however, as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project (or if the same cannot be delivered for reasons not the fault or responsibility of the Contractor, nevertheless all Contractor's obligations necessary to the issuance of such certificates, permits, approvals, or licenses will have been performed.) Without limiting the foregoing, in general, the only remaining Work following Substantial Completion shall be minor in nature, so that the Owner could occupy the Project on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's normal business operations.

§ 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 and the Owner 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, 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.

- 1 If, in Architect's opinion during the inspection, the Project, or the designated portion thereof which Owner has agreed to accept separately, is not sufficiently complete to warrant inspection, or if the list of items to be completed or corrected is not sufficiently complete to warrant inspection, then Architect may terminate the inspection and notify the Contractor that the Project is not ready for inspection. If for such reasons, Architect is required to make additional inspections, the Owner may deduct the cost of Architect's additional services made necessary thereby from any payments due the Contractor. The Architect's compensation shall be determined in accordance with the applicable provisions of the Agreement between the Owner and Architect.
- 2 Except with the consent of the Owner, the Architect will perform no more than ONE (1) inspection to determine whether the Work has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect, Engineer, Consultant or service provider for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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 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.

§ 9.8.6 Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

§ 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 the Contractor, 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 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 and 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.

§ 9.9.2 Immediately prior to such partial occupancy or use, 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 expressly agreed upon in writing, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 When all of the Work is finally completed and the Contractor is ready for a final inspection it shall notify the Owner and the Architect thereof in writing. Thereupon, the Architect and Owner will make final inspection of the Work and, if the Work is complete in full accordance with the Contract Documents and this Contract has been fully performed, the Architect will promptly issue a final Certificate for Payment certifying to the Owner that the Project is complete and the Contractor is entitled to the remainder of the unpaid Contract Price, less any amount withheld pursuant to this Contract. Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work has attained Final Completion in accordance with the Contract Documents. If the Architect is unable to issue its final Certificate for Payment and is required to repeat its final inspection of the Work, the Contractor shall bear the cost of such repeat final inspection(s) which cost may be deducted by the Owner from the Contractor's final payment.

§ 9.10.2 The Contractor shall not be entitled to final payment unless and until it submits to the Architect its affidavit that the payrolls, invoices for materials and equipment, and other liabilities connected with the Work for which the Owner or the Owner's property might be responsible have been fully paid or otherwise satisfied; releases and waivers of liens from all Subcontractors of the Contractor and of any and all other parties required by the Architect or the Owner; such other provisions as Owner may request; and consent of Surety to final payment. If any third party fails or refuses to provide a release of claims or waiver of lien as required by Owner, the Contractor shall furnish a bond satisfactory to the Owner to discharge any such lien or indemnify the Owner from liability

§ 9.10.3 The Owner shall make final payment of all sums due the Contractor not more than thirty-one (31) days after the Architect's execution of a final Certificate for Payment. The Final Payment shall not constitute a waiver of any claims by the Owner.

§ 9.10.4

(Paragraphs deleted)

[Paragraph Deleted.]

§ 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 made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.11 AUDIT

Contractor agrees to maintain adequate books, payrolls and records satisfactory to the Owner in connection with any and all Work performed hereunder. Contractor agrees to retain all such books, payrolls and records (including data stored in computer) for a period of not less than three (3) years after completion of the Work. At all reasonable times, Owner and its duly authorized representatives shall have access to all personnel of Contractor and all such books, payrolls and records, and shall have the right to audit same.

§ 9.12 In addition to any liquidated damages payable to the Owner by the Contractor, if: (1) the Architect is required to make more than one (1) inspection for Substantial Completion; (2) the Architect is required to make more than 1 inspection for Final Completion; or (3) the Work is not substantially complete within thirty (30) days after the date established for Substantial Completion in the Contract Documents; the Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections or services.

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.

- .1 Contractor's employees, agents, and Subcontractors shall not perform any service for Owner while under the influence of alcohol or any controlled stance. Contractor, its employees, agents, and Subcontractors shall not use, possess, distribute, or sell illicit or unprescribed controlled drugs or drug paraphernalia, or misuse legitimate prescription drugs while performing the Work. Contractor, its employees, agents, and Subcontractors shall not use, possess, distribute, or sell alcoholic beverages while performing the Work.
- .2 Contractor has adopted or will adopt its own policy to assure a drug and alcohol free work place while performing the Work.
- .3 Contractor will remove any of its employees from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such employee, 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 employees from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, Contractor's employees 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 employee was in compliance with this contract. Contractor will not use an employee to perform the Work who either refuses to take, or tests positive in, any alcohol or drug test.
- .4 Contractor will comply with all applicable federal, state, and local drug and alcohol related laws and regulations (e.g., Department of Transportation regulations, Department of Defense Drug-Free Workforce Policy, Drug-Free Workplace Act of 1988).
- .5 Owner has also banned the presence of all weapons on the Project site, whether the owner thereof has a permit for a concealed weapon or not.

§ 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 the Owner's premises and other persons who may be affected thereby, which protection shall include the installation of fencing between the Work site and the occupied portion of a connecting or adjacent educational facility;
- .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 fences, trees, shrubs, lawns, walks, athletic fields 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 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 property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.2.4 When use or storage of 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 CONTRACTOR SHALL HOLD OWNER HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO ANY PROPERTY THAT IS ON OR OFF THE SITE AND/OR IN TRANSIT AS REFERRED TO IN CLAUSE 10.2.1.2 EVEN IF SUCH LOSS OR DAMAGE RESULTS FROM OWNER, OWNER'S CONSULTANT'S, OR ARCHITECT'S NEGLIGENCE. AS TO PROPERTY REFERRED TO IN CLAUSE 10.2.1.3, CONTRACTOR SHALL HOLD OWNER FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE CAUSED IN WHOLE OR IN PART BY THE CONTRACTOR, ANY SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM, ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH DAMAGE IS CAUSED IN PART BY THE NEGLIGENT ACTS OR OMISSIONS OF THE OWNER, OWNER'S CONSULTANTS OR ARCHITECT. THE FOREGOING OBLIGATIONS OF THE CONTRACTOR ARE IN ADDITION TO HIS OBLIGATIONS UNDER SECTION 3.18; PROVIDED THAT WHERE THE NEGLIGENCE OF OWNER OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.

§ 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 permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 3 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. No provision of the Contract Documents shall waive Owner's immunity under the Texas Tort Claims Act, Texas Civil Practice and Remedies Code, Chapter 101.

§ 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 the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's 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.

§ 10.3.3 To the extent permitted by the laws and Constitution of the State of Texas, 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. Notwithstanding anything to the contrary contained in this Section 10.3.3, the agreement of the Owner to indemnify, defend and hold harmless the parties described in this Section shall not extend or apply to claims, damages, losses, expenses or liabilities related to, created or caused in whole or in part by a party indemnified hereunder; it being agreed and understood that the Owner and any party so indemnified shall each bear liability for its own negligent acts or omissions, and that such indemnity shall extend only to liability for the negligent acts and omissions of the Owner.

§ 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 [Paragraph Deleted.]

§ 10.4 Emergencies

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.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall carry and maintain in force insurance described below. Prior to execution of the Contract, the Contractor shall procure insurance coverage in the types and amounts as follows:

Workmen's Compensation:
(Including Waiver of Subrogation Endorsement)

All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted.

Employer's Liability:

\$1,000,000.00

Commercial General Liability:

Each Occurrence
General Aggregate

\$1,000,000.00
\$2,000,000.00 (A Designated Construction Project)

Init.

General Aggregate Limit shall be provided)	
Personal & Advertising Injury	\$1,000,000.00 each person
Products and Completed Operations	\$1,000,000.00 (for one (1) year, commencing with issuance of final Certificate for Payment)
Property Damage	\$1,000,000.00 each occurrence
	\$2,000,000.00 aggregate
Independent Contractors	(Same limits as above)
Contractual Liability	(Same limits as above)
Automobile Liability:	
Bodily Injury/Property Damage	\$1,000,000.00 combined single limit
Property Damage	\$1,000,000.00 each occurrence
Umbrella or Excess Liability	\$5,000,000.00 each occurrence/aggregate

All Risk Builders Risk against the perils of fire, lightning, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.

§ 11.1.2 The required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner. The Owner's Representative will contact the State Board of Insurance to confirm that the issuing companies are admitted and authorized to issue such policies in the State of Texas.

§ 11.1.3 The General Liability and Automobile so issued in the name of Contractor shall also name the Owner as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary and non-contributing. The Commercial General Liability coverage provided by Contractor shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.

§ 11.1.4 If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payment made by the insurance carrier on claims paid by this insurance. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.1.5 The insurance required by Section 11.1.1 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. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1.6 Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Section 11.1.1. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance and the provisions of Section 11.1.8 hereof shall apply.

§ 11.1.7 Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements pursuant to Section 11.1.6 hereof have been received by Owner and the Architect has issued a written notice to proceed.

§ 11.1.8 As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for any part or all of the insurance required by Section 11.1 hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.

§ 11.1.9 Workers' Compensation Insurance Coverage.

.1 Definitions:

.1.1 Certificate of coverage ("Certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the division, or a coverage agreement (DWC Form-81, DWC Form-82, DWC Form-83, or DWC Form-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project.

.1.2 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.

.1.3 Persons providing services on the Project ("subcontractor" in Texas Labor Code §406.096). Includes 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 contracts directly with the Contractor and 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 which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

.2 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, Section 401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.

.3 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the contract.

.4 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.

.5 The Contractor shall obtain from each person providing Services on a Project, and provide to the Owner:

.5.1 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

.5.2 no later than seven (7) 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.

.6 The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.

.7 The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten (10) 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.

.8 The Contractor shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, 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.

.9 The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:

.9.1 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,

Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;

- .9.2 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;
- .9.3 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;
- .9.4 obtain from each other person with whom it contracts, and provide to the Contractor:
 - (a) a certificate of coverage, prior to the other person beginning work on the Project; and
 - (b) 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;
- .9.5 retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
- .9.6 notify the Owner in writing by certified mail or personal delivery, within ten (10) 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
- .9.7 contractually require each person with whom it contracts, to perform as required by Subparagraphs .9.1 - .9.7 with the certificates of coverage to be provided to the person for whom they are providing services.
- .10 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 Texas Department of Insurance, 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.
- .11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the Owner. [28 TAC §110.110(c)(7)]

§ 11.1.10 The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Section 3.18.3. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Section 11.1.10.

§ 11.2 Owner's Insurance [Paragraph Deleted.]

(Paragraphs deleted)

§ 11.3 Waivers of Subrogation [Paragraph Deleted.]

(Paragraphs deleted)

§ 11.4 PERFORMANCE BOND AND PAYMENT

§ 11.4.1 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.

§ 11.4.2 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional obligee.

§ 11.4.3 The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. 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. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, 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, 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 an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.

The Sureties shall promptly file a signed copy of the Contract, Performance, and Payment Bonds with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or, in the case of a Construction Manager, as required by Article 8 of the AIA Document A133-2009.

§ 11.4.4 All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. 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 for review and decision.

§ 11.4.5 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.

§ 11.4.6 Upon the request in writing 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 permit a copy to be made.

§ 11.4.7 Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.

§ 11.4.8 By inclusion of this Section 11.4.8 in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

§11.5 Adjustment and Settlement of Insured Loss [Paragraph Deleted.]

(Paragraphs deleted)

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work has been covered and the Architect has specifically requested to see such Work, or if any known deficiencies exist, or the Contract Documents specifically request inspection prior to its being covered, the Architect may request to see that Work and it shall be uncovered by the Contractor. If the Work is not in accordance with the Contract Documents, it must be corrected and covered at the expense of the Contractor. If the Work is according to the Contract Documents, the cost to restore cover on the Work is at the sole expense of the Contractor.

§ 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 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 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 failing to conform to the requirements of the Contract 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.

§ 12.2.2 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 Contract Documents, the Contractor shall correct it promptly after receipt of 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 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 notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 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 be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one (1) year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

§ 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 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 (i) re-execute any parts of the Work that fail to conform with the requirements of this Agreement that appear in the progress of the Work; (ii) remedy any defects in the Work due to faulty materials or workmanship which appear within a period of one (1) year from Substantial Completion of the Work hereunder, or within such longer period of time as may be set forth in the Drawings and Specifications or other Contract Documents; and (iii) 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 injured or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or 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 provisions of 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 Clause 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, an equitable deduction from the Contract Sum shall be made by 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.

§ 12.2.9 Contractor's express warranty herein shall be in addition to, and not in lieu of, any other remedies Owner may have under the Contract Documents, at law, or in equity for defective Work.

§ 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

The Contract shall be governed by the laws of the State of Texas, without regard to choice-of-law rules of any jurisdiction. The Contract is deemed performable entirely in the County in which the Project is located. Any litigation to enforce or interpret any terms of the Contract, or any other litigation arising out of or as a result of the Contract, shall be brought in the State courts of said County. No provision of this Agreement shall waive any immunity or defense.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract 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.

§ 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, 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 as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Except for tests, inspections and approvals required to be provided by the Contractor in the Contract Documents, the Owner will contract for, independently of the Contractor, the inspection services, the testing of construction materials engineering, and the verification testing services necessary for the acceptance of the Work by the Owner. The Contractor shall give timely notice to the persons or entities selected by the Owner of the need for such services. The Contractor shall give the Architect timely 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 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.

§ 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 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.

§ 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

Payments due and unpaid under the Contract Documents shall bear interest in accordance with the Texas Prompt Payment Act, Texas Gov't Code Chapter 2251. Any such payment shall be deemed overdue on the thirty-first (31st) day after Owner receives the Contractor's Certificate for Payment from 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 (46th) day after Owner receives the 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 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 Contract Documents.

§ 13.7 CONTRACTORS RECORDS

§ 13.7.1 Contractor agrees to furnish Owner such information as may be available in Contractor's files and records for the Project for the purpose of aiding Owner in establishing a depreciation schedule for the Project or such portions thereof as Owner may determine.

§ 13.7.2 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll record, daily reports, diaries, logs, instructions, drawings, receipts, contracts, 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 ten (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.

§ 13.7.3 For all Change Orders, Allowances and expenditures from Contingency Funds, Contractor shall also maintain, in accordance with the provisions of Section 13.9.1, the following: contract files, including proposals of successful and unsuccessful bidders, bid recaps and contractor payments; original estimates; estimating Work sheets; general ledger entries detail 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.

§ 13.7.4 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 system shall be satisfactory to the Owner.

§ 13.7.5 Contractor shall keep all Construction Documents related to the Project, 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.

§ 13.7.6 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 overpayment within thirty (30) days of such audit findings, or the Owner, as its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.8 NO THIRD-PARTY BENEFICIARIES

There are no third-party beneficiaries to this agreement.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 If the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the reasons set forth below, the Contractor may terminate the Contract upon twenty (20) days written notice to Owner and Architect if the Work is not allowed to commence within such period. The sole grounds for termination under this Subsection 14.1.1 are as follows:

- .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;
- .3 Because the Owner has not made a payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 [Subsection Deleted.]

§ 14.1.2 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, 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, the Contractor may terminate the Contract so long as Contractor has provided Owner and Architect with written notice of its intent to terminate in the event of additional delays of not less than twenty (20) days and has furnished written notice of termination to Owner and Architect no less than seven (7) days prior to the effective date of termination.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment in an amount which would have been recoverable had the termination been for the Owner's convenience.

§ 14.1.4 If the Work is stopped for a period of 60 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 additional days' 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

- .4 or any Subcontractor becomes insolvent, enters bankruptcy, receivership or other like proceeding; voluntary or involuntarily, or makes an assignment for the benefit of creditors; and the Contractor, within fifteen (15) days after receipt of notice from the Owner, fails to provide satisfactory evidence that the Contractor will either (i) perform the Work of such Subcontractor with the Contractor's own forces, in a timely manner, or (ii) replace the Subcontractor with another similarly qualified Subcontractor who is ready, willing and able to do such Subcontractor's Work in a timely manner
- .5 fails to proceed continuously and diligently with the construction and completion of the Work; except as permitted under the Contract Documents; or
- .6 otherwise is guilty of substantial breach of a provision of the Contract Documents

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, 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.

In any such event, title to the Work and any products thereof, whether completed or partially completed, as well as all materials prepared, procured or set aside by the Contractor for use in the Work, shall vest in the Owner at the Owner's option, and the Owner may enter the Contractor's premises and remove the same therefrom. No election hereunder shall be construed as a waiver of any rights or remedies of the Owner with regard to any breach of the contract Documents.

§ 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.

§ 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.

§ 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 and Contract Time shall be adjusted 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.

§ 14.4.2 Upon receipt of 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, for profit only on that portion of the Work executed, and reasonable costs of demobilization.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, 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 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 Claims [Paragraph Deleted.]

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by the Contractor, must be initiated within 21 days after occurrence of the event giving rise to such Claim. Claims must be initiated by written notice to the Architect and the Owner.

§ 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 notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.3.3 When Owner has an applicable claim for construction defects, Owner shall comply with the provisions of Texas Government Code Chapter 2272 related to the provision of notice of defects and the Contractor's or Architect's opportunity to cure.

§ 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 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Owner's decision, subject to the right of the Contractor to proceed in accordance with this Article 15.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given 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.

§ 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 The Contractor shall be entitled to an extension of the Contract Time for delays or disruptions due to unusually inclement weather in excess of that normally experienced at the job site. Such extension of time will be granted only if such unusual inclement weather prevented the execution of Work on normal working days. Unusual inclement weather as used herein means unusually severe weather which is beyond the normal weather recorded and expected for the locality of the Work and/or the season or seasons of the year. Normal weather conditions shall be determined based upon information compiled from the records of the U.S. Weather Bureau Station at the location of the Work. If unusually inclement weather conditions are the basis for a claim for additional time, such Claim shall be documented by data substantiating such conditions, the fact that the same could not have been reasonably anticipated, and the fact that they had an adverse effect on the scheduled construction. The Contractor shall bear the entire economic risk of all-weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect not later than the fifteenth day of the month following the month during which the delays or disruptions occurred.

(Paragraphs deleted)

§ 15.1.7 CALCULATING CLAIMS FOR DAMAGES

Except as otherwise provided in this Agreement, in calculating the amount of any Claim recoverable by the Contractor, the following standards will apply:

- .1 No indirect or consequential damages will be allowed.
- .2 No recovery shall be based on a comparison of planned expenditures to total actual expenditures, or on estimated loss of labor efficiency, or on a comparison of planned manloading to actual manloading, or any other analysis that is used to show damages indirectly.
- .3 Damages are limited to extra costs specifically shown to have been directly caused by a proven wrong.
- .4 No damages will be allowed for home office overhead or other home office changes or any Eichlay formula calculation.

§ 15.2 Initial Decision

§ 15.2.1 Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect but excluding those arising under Section 10.3, shall be referred initially to the Architect for consideration and recommendation to the Owner. An initial recommendation by the Architect shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless thirty 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 Architect will review Claims and within ten (10) days of receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the Contractor; (2) issue an initial recommendation; (3) suggest a compromise; or (4) advise the parties that the Architect is unable to issue an initial recommendation due to a lack of sufficient information or conflict of interest.

§ 15.2.3 Following receipt of the Architect's initial recommendation regarding a claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Price and/or Contract Time. If no agreement can be reached either party may request mediation of the dispute pursuant to Article 15.

§ 15.2.4 If the 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 Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished.

§ 15.2.5 [Paragraph Deleted.]

§ 15.2.6 [Paragraph Deleted.]

§ 15.2.6.1 [Paragraph Deleted.]

§ 15.2.7 In the event of a Claim against the Contractor, 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 Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 WAIVER OF LIEN

It is distinctly understood that by virtue of this Contract, no mechanic, contractor, materialman, artisan, or laborer, whether skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the building, or any of the improvements of whatever nature or kind so erected or to be erected by virtue of this Contract nor upon any of the land upon which said building or any of the improvements are so erected, built, or situated.

§ 15.3 Mediation

§ 15.3.1 In the event that the Owner or the Contractor shall contend that the other has committed a material breach of this Agreement, the party alleging such breach shall, as a condition precedent to filing any lawsuit, request mediation of the dispute.

§ 15.3.2 Request for mediation shall be in writing, and shall request that the mediation commence not less than thirty (30) or more than ninety (90) days following the date of the request, except upon agreement of both parties.

§ 15.3.3 In the event the Owner and the Contractor are unable to agree to a date for the mediation or to the identity of the mediator or mediators within thirty days following the date of the request for mediation, all conditions precedent in this article shall be deemed to have occurred.

§ 15.3.4 Nothing herein shall preclude the Owner or the Contractor from requesting that the Architect or one or more subcontractors be joined as parties to the mediation, to the extent allowed by their respective contracts..

§ 15.3.5 Unless otherwise agreed in writing by the Owner in the Owner's sole discretion, the Contractor may not bring a legal action against the Owner unless:

- .1 the Contractor has given written notice to the Owner of the Claim, dispute, or other matter giving rise to the legal action within ninety-one (91) days after the date of the start of the event giving rise to the Contractor's Claim, dispute or other matter, and
- .2 the legal action is brought within two (2) years and one (1) day after the date of the start of the event giving rise to Contractor's Claim, dispute or other matter.

§ 15.4 Immunity

§ 15.4.1 Contractor stipulates that Owner is a political subdivision of the State of Texas and, as such, may enjoy immunities from suit and liability under 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 provided by law.

§ 15.4.1.1 [Paragraph Deleted.]

§ 15.4.2 [Paragraph Deleted.]

§ 15.4.3 [Paragraph Deleted.]

§ 15.4.4 [Paragraph Deleted.]

(Paragraphs deleted)

Additions and Deletions Report for

AIA® Document A201® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

Randall Hill Support Center - Warehouse

...

Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 972-775-8296
Fax: 972-775-1701

...

Huckabee & Associates, Inc.
801 Cherry Street, Suite 500
Fort Worth, Texas 76102
Phone: 817-377-2969
Fax: 817-377-2303

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15 CLAIMS AND DISPUTES

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Russo & Kyle P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

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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), Drawings, Specifications, 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. The Contract Documents identified in this Section shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations. In the absence of individual signatures by Owner and Contractor, the Contract Documents identified in the signed contract prevail.

...

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~~ After execution of the Original Contract Documents, the Contract may thereafter be amended or modified only by a written Modification. 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.

...

§ 1.1.9 The terms "bids" or "bidding" shall include any kind of competitive purchasing under the Texas Education Code Chapter 44 and Texas Government Code Chapter 2269.

§ 1.1.10 MISCELLANEOUS OTHER WORDS

§ 1.1.10.1 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 special events.

§ 1.1.10.2 CALENDAR DAY

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

§ 1.1.10.3 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.

§ 1.1.10.4 WORK DAY

Work days include all calendar days except Holidays, Saturdays and Sundays.

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§ 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 included in the cost of the Work the greater quantity or better quality, or the most stringent requirements, unless Contractor shall have obtained, before the submission of Contractor's Proposal, an interpretation in writing from the Architect as to what shall govern. The Architect, in case of such conflict, may interpret or construe the document 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 interests 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.

...

§ 1.2.4 PRECEDENCE OF THE CONTRACT DOCUMENTS

The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

- .1 Contract Modifications signed by Contractor and Owner.
- .2 Addenda, with those of later date having precedence over those of earlier date.
- .3 General Conditions - AIA Document A201-2017, as modified by the Owner for the Project.
- .4 Specifications and Drawings.
- .5 Agreement – AIA Document A101-2017, as modified by the Owner for the Project.

§ 1.2.5 RELATION OF SPECIFICATIONS AND DRAWINGS

Specifications and Drawings are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.6 Where, in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are given, 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 such substitution has been specifically accepted for use on this Project by the Architect.

§ 1.2.7 When the Work is governed by reference to standards, building codes, manufacturer's instructions, or other documents, unless otherwise specified, the current edition as of the Agreement date shall apply.

§ 1.2.8 Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

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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.

...

~~§ 1.7 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.~~

~~§ 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.~~

...

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement Board of Trustees of the Midlothian Independent School District 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. ~~may designate in writing one or more persons to represent the Owner; however, such representatives shall have the authority to bind the Owner only to the extent expressly~~

authorized by the Owner and shall have no implied authority. Except as otherwise provided in Section 4.2.1, the Architect does not have ~~such authority; the authority to bind the Owner.~~ The term "Owner" means the Owner or the Owner's authorized representative.

§ 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. may engage a third-party consultant to represent the Owner. The Owner will notify the Contractor of the identity of such consultant.

§ 2.1.3 The Contractor acknowledges that no lien rights exist with respect to public property.

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§ 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. Pursuant to the requirements of Texas Business and Commerce Code section 56.054(c)(3), the Owner represents that funds are available and have been authorized for the full contract amount of the Work.

§ 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. [Paragraph Deleted.]

§ 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. [Paragraph Deleted.]

§ 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. [Paragraph Deleted.]

...

§ 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.

§ 2.3.4 ~~The Owner~~ If any surveys are needed outside what is shown in the Contract Documents, the Contractor 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.~~

§ 2.3.5 ~~The Owner shall furnish information~~ 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 shall be furnished by the Owner within a reasonable time following actual receipt of a written request.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. The Contractor, Owner and Architect shall agree on an appropriate quantity of drawings and specifications to be printed and distributed for bidding purposes. The drawings shall be provided by the Architect and paid for by the Owner.

§ 2.3.7 Owner's personnel may, but are not required to be present at the construction site during progress of the Work to assist the Architect in the performance of his duties, and to verify the Contractor's record of the number of workmen employed on the Work, their occupational classification, the time each is engaged in the Work, and the equipment used in the performance of the Work for purpose of verification of Contractor's Applications for Payment.

...

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract 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 nonconforming or defective Work as required by Section 12.2, or fails to complete the Work on time as required by Article 3 of the Agreement or is in default of any of its material obligations hereunder, the Owner, by a written order signed by an agent specifically so empowered by the Owner, may order 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. This right shall be in addition to, and not in restriction of, the Owner's right under Section 12.2.

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If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day three-day period after receipt of 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 the Architect. The Architect or Owner may, 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 additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, 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, the Contractor may file a Claim pursuant to Article 15.

...

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents, a good and workmanlike manner except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship.

§ 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 Owner or Owner's consultants, if applicable, conducted in accordance with the Contract Documents or activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the 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 and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including without limitation: (1) the location, condition, layout 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. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site, or for price escalations in the marketplace. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section.

...

- .1 The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the Work installed by other contractors, is not guaranteed by the Architect or the Owner.
- .2 The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other Work, it shall verify at the site all dimensions relating to such existing or other Work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

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§ 3.2.5 Notwithstanding the delivery of a survey or other documents by the Owner, Contractor shall use reasonable efforts to perform all Work in such a manner so as to avoid damaging any utility lines, cables, pipes, or pipelines on the property. Contractor shall be responsible for, and shall repair at Contractor's own expense, any damage done to lines, cables, pipes, and pipelines identified to Contractor.

§ 3.2.6 The Owner and Contractor agree that the Contract Documents may not be free from errors, inconsistencies, or omissions, and further agree that the Owner makes no warranty as to the completeness or accuracy of the Contract documents, either express or implied. Execution of the Contract by the Contractor is a representation that the Contractor has thoroughly reviewed and become familiar with the Contract Documents and that the Contractor is not aware of any errors, inconsistencies or omissions in the Contract Documents which would delay the Contractor in the performance of the Contract Work. The Contractor shall not be entitled to any damages or increase in the Contract Amount due to delays or disruptions to the Work. This limitation on damages is further subject to the limitations set forth in Section 15.1.7.

§ 3.2.7 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 request for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.8 The Contractor shall use the AIA Document G716-2004 "REQUEST FOR INFORMATION" (RFI) form unless otherwise provided in the Contract Documents. The Contractor shall keep a log of all RFI's submitted and number the RFI's consecutively beginning with the number 1.

...

§ 3.3.1.1 The Contractor shall assign a superintendent who shall make decisions in behalf of the Contractor and its Subcontractors. The superintendent shall be on the Project, in this capacity, at all times while Work on the Project is in progress.

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§ 3.3.4 Contractor shall bear responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, chapter C, Sections 756.021, et seq.

§ 3.3.5 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable herefrom 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 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 as described herein.

§ 3.3.6 The Contractor shall review contractor 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 Section 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 Contractor acknowledges that the Work may be performed in connection with an educational facility which is currently occupied and in use. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb, or disrupt Owner's normal operations or facilities. Contractor agrees to and shall comply with all rules, regulations and requirements of the Owner and the school campus on which the Work is to be performed, and shall take all steps necessary to protect and guard the safety of the employees, students and invitees of Owner. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working in an existing facility and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum. The Contractor shall perform all the Work in such a manner as to cause minimum interference with the operations of the Owner and other contractors and Subcontractors on the site, and shall take, and cause the Contractor's and its Subcontractor's employees, agents, licensees and permittees to take all necessary precautions to protect the Work and the site and all persons and property thereon from damage or injury.

§ 3.3.8 Representatives of the Owner, Contractor, and Architect shall 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.

§ 3.3.9 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.

§ 3.3.10 In the event Contractor shall fall behind schedule at any time, for any reason, Owner shall be entitled to direct acceleration or resequencing of the Work to bring the Work back on schedule. In the event Contractor determines that the Scheduled Completion Date cannot be met by resequencing the Work, then Contractor shall immediately provide to the Owner, and in any event within seven (7) days after the date of receipt of any request by Owner for resequencing or acceleration, a plan to complete the Work in the shortest possible time. No approval by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor pursuant to this paragraph 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 Scheduled Completion Date.

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, 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. The Owner shall pay fees for public or private water, gas, electrical and other utility service at the site. The Contractor shall secure and arrange for all necessary utility connections.

§ 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 consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.1.1 PREVAILING WAGES

The Project is subject to the Texas Government Code, Chapter 2258, Prevailing Wage Rates. This statute requires the Contractor and any Subcontractor to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

§ 3.4.1.2 In accordance therewith, the Owner has established a scale of prevailing wages which is incorporated in the Project specifications, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the Work at the time of construction.

§ 3.4.1.3 A Contractor or Subcontractor who violates the provisions of Sections 3.4.1.1 or 3.4.1.2 shall pay to Owner the sum of Sixty Dollars and No/100 (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rate stipulated in the scale of prevailing wages applicable to this Project, as required by Texas Government Code Section 2258.023(b).

§ 3.4.2.1 Substitutions and alternates may be rejected 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; and (iii) when in the judgment of the Owner or 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 and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other information necessary for a complete evaluation of the substitution; (ii) a written explanation of the reasons the substitution is necessary, 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 the (a) the proposed substitution confirms to and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings, and (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitutions shall be submitted in triplicate to the Architect in sufficient time to allow the Architect no less than twenty-one (21) working days for review. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

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

§ 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 shall be responsible for the actions of Contractor's forces, Subcontractor's forces and all tiers of Sub-subcontractor's forces. The Contractor recognizes that the Project Site is a public-school campus, and will prohibit the possession or use of alcohol, controlled substances, tobacco, and any prohibited weapons on the Project Site and shall require adequate dress of the Contractor's forces consistent with the nature of the Work being performed, including wearing shirts at all times. Sexual harassment of employees of the Contractor or employees or students of the Owner by employees of the Contractor is strictly forbidden. Any employee of the Contractor who is found to have engaged in such conduct shall be subject to appropriate disciplinary action by the Contractor, including removal from the job site.

§ 3.4.4 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project.

§ 3.4.5 CRIMINAL HISTORY RECORDS CHECKS

§ 3.4.5.1 For purposes of this Section 3.4.5 (and all subsections) the following definitions shall be applicable:

- .1 "Continuing Duties" shall mean work duties that are performed pursuant to a contract on a regular, repeated basis rather than infrequently or one-time only.
- .2 "Covered Employees", shall mean, all employees of Contractor, as well as employees of Contractor's subcontractors, consultants or independent contractors (of every tier), who will have Continuing Duties related to the services contracted for herein and the Opportunity For Direct Contact With Students in connection with the subject employee's Continuing Duties.
- .3 "Disqualifying Criminal History" means: a conviction within the last 30 years, related to one or more 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: (1) a felony offense under Texas Penal Code Title 5 Offenses Against Persons (homicide; kidnapping, unlawful restraint, smuggling of persons, trafficking of persons, sexual offenses; and assault offenses); (2) an offense for which a defendant is required to register as a sex offender under Texas Code of Criminal Procedure Chapter 62; or (3) an equivalent offense under federal law or the laws of another state. Contractor shall assume all expenses associated with obtaining criminal history record information, providing the certification, and performing Contractor's responsibilities as set out herein.
- .4 "Opportunity For Direct Contact With Students" is contact that results from activities that provide a substantial opportunity for verbal or physical interaction with students, and that is not supervised by a certified educator or other professional district employee. An employee is not considered to have an Opportunity For Direct Contact With Students if: (1) the employee's work does not involve the construction alteration or repair of an Instructional Facility; (2) the employee's work involves construction of a new Instructional Facility and the person's duties related to the contacted services will be completed not later than the seventh day before the first date the facility will be used for instructional purposes; or (3) if the employee's work involves an existing Instructional Facility and:
 - a. the project site area contains sanitary facilities and is separated from all areas used by students, by a secure barrier fence that is not less than six feet in height; and
 - b. the Contractor has adopted a written policy applicable to its employees, as well as employees of its subcontractors (of any tier) and its independent contractors and consultants, which prohibits these parties from interacting with students or entering areas used by students, informs these parties of the policy, and enforces the policy on the Project site and at any other areas where the Work of this Contract will be conducted.
 - c. the Contractor has sought and received written approval by the District of the adopted policy (including its enforcement provisions) and Contractor's its means of informing the relevant parties of the existence of the policy.
 - d. Contractor certifies that, if it has taken the above precautions or imposed conditions to ensure that the Contractor's employees and employees of any of its subcontractors, independent contractors, or consultants, will not become Covered Employees, then Contractor will make reasonable efforts to ensure that these precautions or conditions continue throughout the time the contracted services are provided.
- .5 "Instructional Facility" is defined as real property or improvements to real property, or a necessary fixture of an improvement to real property that is used predominantly for teaching the curriculum required under Texas Education Code § 28.002; Texas Education Code § 22.08341(a)(2); and Texas Education Code § 46.01.

§ 3.4.5.2 Pursuant to Texas Education Code §22.08341, Contractor shall obtain criminal history record information through the Fingerprint-Based Applicant Clearinghouse of Texas ("FACT Clearinghouse"), for all of Contractor's Covered Employees. To the extent, Contractor does not have a direct contractual connection with a lower-tier subcontractor, Contractor shall require its subcontractor, independent contractors, and consultants, by the terms of their respective contract with Contractor, to obtain the required criminal history record information through the FACT Clearinghouse, for their Covered Employees, and that such subcontractors, independent contractors, and consultants of Contractors subcontractors, require their subcontractors, independent contractors, and consultants of every tier, to timely make the same certifications to the Contractor as those required by the Owner from the Contractor herein, in order to allow Contractor to timely provide the certifications to the Owner required by the following paragraph, pursuant to Texas Education Code §22.08341. If Contractor is required by this subsection to obtain criminal history record information through the FACT Clearinghouse, then Contractor will subscribe the FACT Clearinghouse for

purposes of receiving updates to the criminal history record information it obtained and shall require the same of its lower-tier subcontractors, independent contractors and consultants, by contract.

§ 3.4.5.3 If Covered Employees will be working on the Project, before beginning any Work on the Project, Contractor will provide written certification to the Owner that Contractor that the criminal history review requirements for all Covered Employees working on the Owner's Project have been satisfied, and specifically that Contractor:

- .1 has obtained the required criminal history record information through the FACT Clearinghouse for its Covered Employees;
- .2 has obtained written certification from its subcontractors independent contractors, and consultants (of any tier) that they have obtained the required criminal histories documentation through the FACT Clearinghouse for the subcontractor's, independent contractors', and consultants' Covered Employees; that the criminal history review requirements for all Covered Employees working on the Owner's Project have been satisfied; that either none of their respective Covered Employees had a Disqualifying Criminal History, or if a Covered Employee had a Disqualifying Criminal History they have been excluded from assignment to the Project; and that if the subcontractor, independent contractor, or consultant receives information during the performance of this Contract that one of its Covered Employees associated with the Work of this Contract, is subsequently reported to have a Disqualifying Criminal History or offense, it will immediately remove the Covered Employee from the project site or any other District Property where the Work of this Contract will be conducted and notify the Contractor in writing within three (3) business days;
- .3 will not assign or permit Covered Employees (of either Contractor or any of its subcontractors, independent contractors, or consultants) with a Disqualifying Criminal History to performing any work on Owner's project or on Owner's property where the Work of this Contract will be conducted;
- .4 if Contractor receives information during the performance of this Contract that a Covered Employee associated with the Work of this Contract, is subsequently reported to have a Disqualifying Criminal History or offense, it will immediately remove the Covered Employee from the project site or any other District Property where the Work of this Contract will be conducted and notify the Owner in writing within three (3) business days; and
- .5. if any employee associated with the work under this Contract is not a Covered Employee will make a reasonable effort to ensure that the reasons the employee is determined not to be a Covered Employee will continue to exist throughout the time the contracted services are provided.

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§ 3.5.3 The Contractor agrees to assign to the Owner at the Time of Final Completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties. As a condition precedent to final payment, the Contractor shall submit to Owner a complete set of warranties from contractors, manufacturers, or suppliers as appropriate, and executed by Contractor as required, with a warranty commencement date as required by the Contract Documents.

§ 3.5.4 Contractor's express warranty herein shall be in addition to, and not in lieu of, any other remedies Owner may have under this Agreement, at law, or in equity for defective Work.

§ 3.5.5 The warranties provided in Section 3.5 shall be in addition to and not in limitation of any other warranty or remedy required by law or by the Contract Documents, and such warranty shall be interpreted to require Contractor to replace defective materials and equipment and re-execute defective Work which is disclosed to the Contractor by the Owner within a period of one (1) year after Substantial Completion of the entire Work or if latent defect, within one (1) year after discovery thereof by Owner.

§ 3.5.6 The Contractor shall issue in writing to the Owner as a condition precedent to final payment a "General Warranty" reflecting the terms and conditions of Sections 3.5.2 and 3.5.3 for all Work under the Contract Documents. This General Warranty shall be assignable. Submittal of all warranties and guarantees are required as a prerequisite to the final payment.

§ 3.5.7 Except when a longer warranty time is specifically called for in the Specification Sections or is otherwise provided by law, the General Warranty shall be for twelve (12) months and shall be in form and content otherwise satisfactory to the Owner. Contractor acknowledges that the Project may involve construction work on more than one

(1) building for the Owner. Each building, or approved phase of each building, may have its own, separate, and independent date of Substantial Completion or Final Completion. Contractor shall maintain a complete and accurate schedule of the dates of Substantial Completion, dates upon which the one (1) year warranty on each phase or building which is substantially complete will expire, and dates of Final Completion. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one (1) month prior to the expiration of the one (1) year warranty period on each building or each phase of the building which has been substantially completed. Prior to termination of the one (1) year warranty period, Contractor shall accompany the Owner and Architect on reinspection of the building and be responsible for correcting any reasonable additional deficiencies not caused by the Owner or by the use of the building which are observed or reported during the reinspection. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within three (3) days of initial notification from Owner. Contractor shall prosecute the Work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period. If Contractor fails to provide notice of the expiration of the one (1) year warranty period at least one (1) month prior to the expiration date, Contractor's warranty obligations described in this Section shall continue until such inspection is conducted and any deficiencies found in the inspection corrected.

§ 3.5.8 Warranties shall become effective on a date established by the Owner and Architect in accordance with the Contract Documents. This date shall be the date of Substantial Completion of the entire Work, unless otherwise provided in any Certificate of Partial Substantial Completion approved by the parties, except for Work to be completed or corrected after the date of Substantial Completion and prior to final payment. Warranties for Work to be completed or corrected after the date of Substantial Completion and prior to final payment shall become effective on the later of the date the Work is completed or corrected and accepted by the Owner and Architect or the date of final payment.

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, not include in the Contract Price or any Modification any amount for sales, use, or similar taxes for which (1) a Texas independent school district is exempt, and (2) the Owner has provided the Contractor with a tax exemption certificate or other documentation necessary to establish the Owner's exemption from such taxes.

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§ 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 performing its obligations hereunder, the Contractor shall fully comply with all applicable laws, ordinances, rules, regulations, lawful orders and decrees of all applicable authorities, and when requested shall furnish evidence satisfactory to the owner of such compliance.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction. The Contractor agrees to indemnify, defend and hold harmless the Owner, its trustees, officers, representatives, agents and employees from and against all claims, fines, penalties, or liabilities from or arising out of such Work, or based upon the actual or asserted violation of any laws, ordinances, rules, regulations, orders or decrees applicable to such Work.

§ 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 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and 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.

§ 3.7.4 Concealed or Unknown Conditions. Claims for Concealed or Unknown Conditions.

Contractor acknowledges that there may exist at the Project site certain soil and geological conditions and/or surface physical conditions which are not disclosed in the Contract Documents, and which have been known to or may be reasonably anticipated to occur in the area or be related to any past use of the Project site, including, without limitation, the presence of rock and its hardness, geologic formations, differing soils, and surface structures, equipment or other impediments, either natural or man-made (collectively, "Subsurface Conditions"). Owner makes no representations or warranties regarding Subsurface Conditions at the Project site, or of the accuracy or continuity of conditions which may be noted in any reports furnished or made available to Contractor. Contractor covenants and agrees that any such reports are furnished or made available by Owner to Contractor for information purposes only, and Contractor acknowledges that Owner is not responsible for the content thereof. Contractor shall be responsible for inspecting the site and determining the existence or likelihood of any Subsurface Conditions which may affect the Contract Time or the Contract sum, or both. The Contract Time and the Contract Sum bid by Contractor shall be deemed to include all costs of and time to complete all Work associated with or attributable to Subsurface Conditions, and Contractor shall not be entitled to submit a claim for or to obtain an extension of the Contract Time or increase in the Contract Sum due to the existence of Subsurface Conditions. Except as provided above with respect to Subsurface Conditions, if conditions are encountered at the site which are concealed physical conditions which were not known to the Contractor and which differ substantially from those indicated in the Contract Documents, then the Contractor shall notify the Owner and the Architect of such conditions promptly before conditions are disturbed, and in no event less than three (3) days after first observation of the conditions. The Architect will promptly investigate such conditions and report its findings to the Owner. If the Owner and the Contractor cannot agree on an adjustment to the Contract Sum or Contract Time, the adjustment shall be subject to mediation pursuant to 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. 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 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. Contractor's obligations under this Section do not require it to perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites. However, any drainage alterations made by Contractor during the construction process which require the issuance of a permit shall be at Contractor's sole cost.

§ 3.7.7 The Contractor shall certify in writing that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by Local/State 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 Instruments of Service related to Contract Closeout.

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§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner ~~with reasonable promptness~~ within such time as is reasonably specified by the Contractor as necessary to avoid delay in the Work.

§ 3.8.4 When performing Work under allowances, where reasonably possible, Contractor shall solicit and receive no fewer than three (3) written proposals and shall provide the Work as directed by the Architect, upon Owner's written approval, on the basis of the best value for the Owner.

...

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall not replace the Superintendent prior to Final Completion of the Work unless (1) the Superintendent shall cease to be employed by the Contractor or its subsidiaries or affiliated companies, or (2) the Owner agrees to such replacement. The Superintendent may not be employed on any other project prior to Final Completion of the Work. From Substantial Completion to Final Completion, the Superintendent shall be on-site as necessary to ensure that Final Completion occurs within thirty (30) days of Substantial Completion.

§ 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 shall furnish a list to the Architect of all engineers, consultants, job-site superintendents, Subcontractors and suppliers involved in construction. The Architect shall provide such information to the Owner.

- .1 The Owner may reject or require removal of any engineer, consultant, job superintendent, or employee of the Contractor, Subcontractor or Sub-subcontractor involved in the Project.
- .2 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 The Owner reserves the right to utilize one or more of its employees to function in the capacity of the Owner's inspector, whose primary function will be daily inspections, checking pay requests, construction timelines, and storage of supplies and materials.

§ 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. Owner shall be notified not less than twenty-four (24) hours before any time that superintendent will not be present at the site for any reason except 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, the Contractor is subject to being back charged in the amount of TWO HUNDRED FIFTY AND NO/100 DOLLARS (\$250.00) for each day.~~

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§ 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.~~ contractor's initial constructions schedule for the Work utilizing critical path method scheduling techniques. The initial schedule shall not exceed the time limits set forth in the Contract Documents. The initial schedule shall thereafter be updated on a monthly basis and submitted with each application for payment. The receipt of an updated schedule with each application for payment shall be a condition precedent to the Owner's duty to make any payment pursuant to Article 9.6.

- .1 Each schedule shall break the Work into a sufficient number of activities to facilitate the efficient use of critical path method scheduling by the Contractor, Owner, and Architect. Each schedule activity shall be assigned a cost value consistent with the Schedule of Values so as to allow the Owner and Contractor to project cash flow for the Project.
- .2 Each schedule shall include activities representing manufacturing, fabrication, or ordering lead time for materials, equipment, or other items for which the Architect is required to review submittals, shop drawings, product data, or samples.

- .3 Each schedule, other than the initial schedule, shall indicate the activities, or portions thereof, which have been completed; shall reflect the actual time for completion of such activities; and shall reflect any changes to the sequence or planned duration of all activities.
- .4 If any updated schedule exceeds the time limits set forth in the Contract Documents for completion of the Work, the Contractor shall include with the updated schedule a statement of the reasons for the anticipated delay in completion of the Work and the Contractor's planned course of action for completing the Work within the time limits set forth in the Contract Documents. If the Contractor asserts that the failure of the Owner or the Architect to provide information to the Contractor is the reason for anticipated delay in completion, the Contractor shall also specify what information is required from the Owner or Architect.
- .5 Neither the Owner or the Contractor shall have exclusive ownership of float time in the schedule, and all float time shall inure to the benefit of the Project. The Contractor agrees to use its best efforts not to sequence the Work or assign activity durations so as to produce a schedule in which more than one-fourth of the remaining activities have no float time.
- .6 Submission of any schedule under this Contract constitutes a representation by the Contractor that: (1) the schedule represents the sequence in which the Contractor intends to prosecute the remaining Work; (2) the schedule represents the actual sequence and durations used to prosecute the completed Work; (3) that to the best of its knowledge and belief the Contractor is able to complete the remaining Work in the sequence and time indicated; and, (4) that the Contractor intends to complete the remaining Work in the sequence and time indicated.

...

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect. Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.4 In the event the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitations, (i) working additional shifts of overtime, (ii) supplying additional manpower, equipment and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

- .1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subparagraph 3.10.5.
- .2 The Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.5 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.5 If reasonably required by Owner, Contractor shall also prepare and furnish project cash flow projections, manning data for critical activities, and schedules for the purchase and delivery of all critical equipment and material, together with periodic updating thereof.

§ 3.10.6 The Contractor shall recommend to the Owner and to the Architect a schedule for procurement of long-lead time items which will constitute part of the Work as required to meet the Project schedule. If such long-lead time items are procured by the Owner, they shall be procured on terms and conditions as recommended by the Contractor. Upon the Owner's acceptance of the Contractor's Stipulated Sum proposal, all contracts previously entered into by Owner

shall be assigned by Owner to the Contractor who shall accept responsibility for such contracts as if it had initially entered into such contracts. Contractor shall expedite the delivery of long-lead time items. The Contractor shall receive and protect all Owner supplied material.

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§ 3.11.1 Contractor shall make available, at the Project site, job records, including, but not limited to, invoices, payment records, payroll records, daily reports, logs, diaries, and job meeting minutes, applicable to the Project. Contractor shall make such reports and records available to inspection by the Owner, Architect, or their respective agents.

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§ 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~~ not be responsible for the adequacy of the performance and design criteria provided specified 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 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.

...

§ 3.12.10.3 The Architect's review of Contractor's submittals will be limited to one examination of an initial submittal and one (1) examination of a resubmittal. 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 deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

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. The Contractor shall so conduct its operations as not to unreasonably interfere with traffic on public thoroughfares adjacent or near to the Project site.

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§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall, not less than two times each week, clean up by removing rubbish, including old and surplus materials. 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 materials, and shall clean, sweep, mop, brush and polish, as appropriate, the interior of the improvements or renovated areas, including but not limited to, any floors, carpeting, ducts, fixtures, and ventilation units operated during construction. Contractor shall clean exterior gutters, drainage, walkways, driveways and roofs of debris.

...

§ 3.15.3 The Contractor shall be responsible for damaged or broken glass, and at completion of the Work, shall replace such damaged or broken glass.

...

§ 3.16.1 Upon request of the Architect or Owner, the Contractor shall accompany the Architect or Owner on an inspection of the Work.

...

§ 3.18.1 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. **TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR WAIVES AND RELEASES ALL CLAIMS AGAINST AND SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER, OWNER'S CONSULTANTS, THE ARCHITECT, THE ARCHITECT'S CONSULTANTS, AND THEIR RESPECTIVE AGENTS AND EMPLOYEES FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING ATTORNEY'S FEES, ARISING OUT OF, OR RESULTING FROM THE PERFORMANCE OF THE WORK, PROVIDED THAT ANY SUCH CLAIM, DAMAGE, LOSS OR EXPENSE: (1) IS ATTRIBUTABLE TO BODILY OR PERSONAL INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF) INCLUDING THE LOSS OF USE RESULTING THEREFROM, AND (2) IS CAUSED IN WHOLE OR IN PART BY ANY WILLFUL OR NEGLIGENT ACT OR OMISSION OF THE CONTRACTOR, ANY SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT CAUSED IN PART BY THE NEGLIGENT ACTS OR OMISSIONS OF OWNER, OWNER'S CONSULTANTS, THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS, WHERE THAT NEGLIGENCE IS A CONCURRING CAUSE OF THE INJURY, DEATH, OR DAMAGE. HOWEVER, THE INDEMNITY PROVIDED FOR IN THIS SECTION SHALL HAVE NO APPLICATION TO ANY CLAIM, LOSS, DAMAGE, CAUSE OF ACTION, SUIT, OR LIABILITY WHERE THE INJURY, DEATH, OR DAMAGE RESULTS FROM THE SOLE NEGLIGENCE OF OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS UNMIXED WITH THE FAULT OF ANY OTHER PERSON OR ENTITY; PROVIDED THAT WHERE THE NEGLIGENCE OF OWNER, OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.**

§ 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. **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 ACT OR INSURANCE, DISABILITY ACTS OR INSURANCE OR OTHER EMPLOYEE BENEFIT ACTS OR RELATED INSURANCE.**

§ 3.18.3 CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL HOLD OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS FREE AND HARMLESS FROM

LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO CONTRACTOR'S OR ITS SUBCONTRACTORS' CONSTRUCTION TOOLS AND EQUIPMENT AND RENTED ITEMS WHICH ARE USED OR INTENDED FOR USE IN PERFORMING THE WORK, REGARDLESS OF WHETHER SUCH LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OF OWNER, OWNER'S CONSULTANTS, ARCHITECT OR ARCHITECT'S CONSULTANTS. THIS PROVISION SHALL APPLY, WITHOUT LIMITATION, TO LOSS OR DAMAGE OCCURRING AT THE WORK SITE OR WHILE SUCH ITEMS ARE IN TRANSIT TO OR FROM THE WORK SITE AND IS IN ADDITION TO CONTRACTOR'S OBLIGATIONS UNDER SECTION 3.18.1. IT IS THE EXPRESS INTENTION OF THE PARTIES HERETO, BOTH CONTRACTOR AND OWNER, THAT THE INDEMNITY IS PROVIDED FOR IN THIS SECTION AS TO CONTRACTOR'S OR ITS SUBCONTRACTOR'S TOOLS AND EQUIPMENT AND RENTAL ITEMS, IS AN AGREEMENT BY CONTRACTOR TO INDEMNIFY AND PROTECT OWNER FROM THE CONSEQUENCES OF OWNER'S OWN NEGLIGENCE, AND THAT OF OWNER'S CONSULTANTS, THE ARCHITECT AND ARCHITECT'S CONSULTANTS WHETHER THAT NEGLIGENCE IS THE SOLE OR CONCURRING CAUSE OF THE LOSS OR DAMAGE. PROVIDED HOWEVER, THAT WHERE THE NEGLIGENCE OF OWNER OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.

§ 3.18.4 Indemnification hereunder shall include, without limiting the generality of the foregoing, liability which could arise to the Owner, its agents, consultants, and representatives or the Architect pursuant to State statutes for the safety of workmen and in addition, all Federal statutes and rules existing thereunder for protection, occupational safety and health to workmen. It being agreed that the primary obligation of the Contractor is to comply with said statutes in performance of the Work by Contractor and that the obligations of the Owner, its agents, consultants, and representatives under said statutes are secondary to that of the Contractor.

§ 3.18.5 THE PROVISIONS OF ARTICLE 3.18 IN ITS ENTIRETY SHALL SURVIVE THE COMPLETION, TERMINATION OR EXPIRATION OF THIS CONTRACT.

§ 3.19 REPRESENTATIONS AND WARRANTIES

§ 3.19.1 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 plant, tools, materials, supplies, equipment and labor required to 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 and public quasi-public authorities having jurisdiction over it and over the Work and the site of the Project;
- .4** that the execution of the Contract and its performance thereof is within its duly authorized powers; and
- .5** that its duly authorized representative has visited the site of the Work, familiarized itself with the local conditions under which the Work is to be performed and correlated its observations with the requirements of the Contract Documents.

§ 3.20 BUSINESS STANDARDS

§ 3.20.1 Contractor, in performing its obligations under Contract, shall establish and maintain appropriate business standards, procedures, and controls, including those necessary to avoid any real or apparent impropriety or adverse impact on the interest of Owner or affiliates. Contractor shall review, with Owner, at a reasonable frequency during the performance of the Work hereunder, such business standards and procedures including, without limitation, those related to the activities of Contractor's employees and agents in their relations with Owner's employees, agents, and representatives, vendors, Subcontractors, and other third parties, and those relating to the placement and administration of purchase orders and contracts.

§ 3.21 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.

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~~§ 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.~~[Paragraph Deleted.]

...

~~§ 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 Certificate for Payment. Owner's contract with the Architect terminates.~~ The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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§ 4.2.6 The Architect or the Owner has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect or the Owner considers it necessary or advisable, the Architect or the Owner will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect or the Owner 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. Certain portions of the Work will be tested and/or observed at various stages, sometimes off the Project site, between initial observation or review and final positioning of the completed Work. Nothing in any initial or prior approval or test result shall govern if at any subsequent time the Work or any portion thereof is found not to conform to the requirements of the Contract Documents.

§ 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 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 reasonable promptness 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 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 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 Contract Documents, the 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, so as to keep from delaying the Work or the activities of the Owner, Contractor or other Contractors.

...

§ 4.2.9 The Architect and the Owner 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.

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~~§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon written request of the Owner or Contractor, the Architect will issue its interpretation of the requirements of the plans and specifications. 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 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, 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's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents. Documents and not expressly overruled in writing by the Owner.~~

~~§ 4.2.14 The Architect will review and respond to requests for information about 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. information at no additional expense to the Owner.~~

~~§ 4.2.15 The Architect may appoint an employee or other person to assist the Architect during the construction. These representatives will be instructed to assist the Contractor in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's Representative may have allowed Work not in accordance with the Contract Documents shall not prevent the Architect from insisting that the faulty Work be corrected to conform to the Contract Documents and the Contractor shall correct same.~~

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~~§ 5.3.1 Neither the Owner nor the Architect shall be obligated to pay or to insure the payment of any monies to Subcontractors or vendors by the Contractor.~~

~~§ 5.3.2 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 contract. 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.~~

...

- ~~.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and~~

...

~~§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall may, in the Owner's sole discretion, be equitably adjusted for increases in cost resulting from the suspension.~~

~~§ 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.~~

...

~~§ 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. Contract.

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§ 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 the Architect 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. Failure of the Contractor to notify the Architect 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 to receive the Contractor's Work. ~~The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.~~

...

§ 7.1.4 On Change Orders and Construction Change Directives, the total Contractor mark-up for overhead and profit included in the total cost to the Owner shall be based upon the following schedule:

- .1 For the Contractor, for Work performed by the Contractor's own forces, ten percent (10%) of the cost (0% for change orders to be paid out of any contingency allowance).
- .2 For the Contractor, for the Work performed by the Contractor's Subcontractors, four percent (4%) of the amount due the Subcontractors (0% for the change orders to be paid out of any contingency allowance).
- .3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, ten percent (10%) of the cost.
- .4 The costs to which the above percentages shall be applied will be determined in accordance with Section 7.3.7.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including quantities and unit costs of labor and materials extended and totaled.

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§ 7.2.2 Acceptance of a disbursement from any allowance fund, contingency fund or acceptance of a Change Order by the Contractor shall constitute full accord and satisfaction for any and all claims, whether direct or indirect, including but not limited to impact, delay or acceleration damages, arising from the subject matter of the disbursement or Change Order.

...

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of 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.~~ Section 7.1.4. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect and the Owner 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:

...

- .4 Costs of premiums for all bonds and insurance, permit fees, and applicable sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change, change only if the adjustment causes an extension of the Contract Time.

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§ 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 ~~as confirmed by the Architect, plus overhead and profit as set forth in Section 7.1.4.~~ 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.

...

§ 8.1.2 The date of commencement of the Work ~~is the date established in the Agreement.~~ shall be the first business day following the Contractor's written notice to proceed. The notice to proceed shall not be issued until the Agreement has been signed by the Contractor and the Owner, the Owner and Architect have received and approved as to form all required payment and performance bonds and insurance as required by Article 11.

§ 8.1.3 The date of Substantial Completion ~~is the date certified by the Architect in accordance with Section 9.8.~~

§ 8.1.3.1 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.3.2 The date of Final Completion is the date certified by the Architect in accordance with Section 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than thirty (30) days after the date of Substantial Completion.

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§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor ~~confirms~~ stipulates 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.~~ Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

...

§ 8.2.4 In the event Substantial Completion is not achieved by the designated date, or as it may be extended, Owner may withhold payment of any further sums due until Substantial Completion is achieved. Owner shall also be entitled to deduct out of any sums due to Contractor any or all liquidated damages due Owner in accordance with the Contract Documents.

§ 8.2.5 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: FIVE HUNDRED AND NO/100 DOLLARS (\$500.00).

§ 8.2.6 If one or more of the Liquidated Damages provisions set out in the Agreement are held to be legally unenforceable as a penalty (except when the holding is the result of a challenge by the Owner), the Owner shall be allowed to recover actual damages caused by the Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.2.7 In addition to Liquidated Damages, if any, the Contractor shall reimburse the Owner for any Supplemental or Additional Services of the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor or caused by Contractor's failure to achieve the applicable Contract Time requirements.

§ 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, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the

~~Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine. The Owner, except as provided for in this Section 8.3.1, shall not be liable to the Contractor for delay to the Contractor's Work by the act, neglect or default of the Owner or the Architect, or by reason of fire, act of God, riot, strike, action of workmen or others, or any cause beyond the Owner's control. Should the Owner or Architect delay the Contractor in the Work, Contractor shall receive an extension of time for completion equal to the delay if a written claim is made within forty-eight (48) hours, and under no circumstances shall the Owner be liable to pay the Contractor any compensation for such Owner-caused delays.~~

...

~~§ 8.3.3 This Section 8.3 Agreement does not preclude permit recovery of damages for delay by either party under other provisions of the Contract Documents. the Contractor for delay, disruption or acceleration. Contractor agrees that Contractor shall be fully compensated for all delays solely by an extension of time.~~

...

~~§ 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. All costs of overtime Work required by the Contract Time and the nature of the Work, as set forth in or inferable from the Contract Documents, except costs of emergencies covered in Section 10.4, shall be and are included in the Contract.~~

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~~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 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, Architect or the Owner, 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.~~

...

~~§ 9.3.1 At least ten days before the date established for each progress payment, In accordance with the requirements of Section 5.1.3 of the Agreement, 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 require, 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. shall reflect. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703-1992, Continuation Sheet.~~

...

~~§ 9.3.1.3 Contractor agrees that, for purposes of Texas Government Code section 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 Architect's Certificate for Payment shall be construed as a receipt of an invoice by the Owner, for purposes of Texas Government Code section 2251.042.~~

~~§ 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. Except as otherwise agreed in writing, executed by the Owner and Contractor prior to delivery of material and equipment, the Contractor is not entitled to payment for material and equipment delivered and stored on site or off site. The Owner may, in the Owner's sole discretion, agree to make payment for materials stored on site or off site and may, as a condition precedent to the grant of such consent, establish reasonable procedures and requirements (including provision of additional insurance at Contractor's sole expense) with which Contractor must comply.~~

§ 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 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 In each Request for Payment, Contractor shall certify that there are no known mechanics' or materialmen's liens outstanding at the date of this requisition, 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 application and that except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmen's liens on the Work, and that releases from all contractors 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 theretofore performed and for which payment has been made by Owner to Contractor.

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§ 9.5.1 The Architect ~~or the Owner~~ 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

...

- .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; Documents;
- .8 delay beyond the times set forth elsewhere in the Contract Documents including but not limited to the submission for approval of the schedule of values, cost breakdowns on proposal requests, progress schedule, list of Subcontractors and insurance requirements;
- .9 evidence of financial inability to perform the Contract fully;
- .10 failure to submit record documents required by the Contract; or
- .11 failure of the Contractor to perform any other obligations of the Contract.

§ 9.5.2 ~~When either party disputes the Architect's~~ If the Contractor disputes the Architect's or the Owner'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. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1.

§ 9.6.1 After the Architect has issued and the Owner has approved a Certificate for Payment, the Owner shall make payment of disputed amounts in the manner and within the time provided in the Contract Documents, and shall so notify the Architect. Owner shall notify Contractor within twenty-one (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 shall, within ten (10) days following 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. pay all undisputed bills for labor and materials performed and furnished by others in connection with the construction, furnished and equipping of the improvements and the performance of the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this contract. Contractor shall include a provision in each of its contracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder. 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, the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.~~

...

§ 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. The Contractor shall, as a condition precedent to any obligation of the Owner under the Contract Documents, provide to the Owner payment and performance bonds in the full penal amount of the Contract in accordance with Texas Government Code Chapter 2253.~~

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 if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect and approved by the Owner or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the 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.

...

§ 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; provided, however, as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project (or if the same cannot be delivered for reasons not the fault or responsibility of the Contractor, nevertheless all Contractor's obligations necessary to the issuance of such certificates, permits, approvals, or licenses will have been performed.) Without limiting the foregoing, in general, the only remaining Work following Substantial Completion shall be minor in nature, so that the Owner could occupy the Project on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's normal business operations.

...

§ 9.8.3 Upon receipt of the Contractor's list, the Architect and the Owner 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, 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.

- .1 If, in Architect's opinion during the inspection, the Project, or the designated portion thereof which Owner has agreed to accept separately, is not sufficiently complete to warrant inspection, or if the list of items to be completed or corrected is not sufficiently complete to warrant inspection, then Architect may terminate the inspection and notify the Contractor that the Project is not ready for inspection. If for such reasons, Architect is required to make additional inspections, the Owner may deduct the cost of Architect's additional services made necessary thereby from any payments due the Contractor. The Architect's compensation shall be determined in accordance with the applicable provisions of the Agreement between the Owner and Architect.
 - .2 Except with the consent of the Owner, the Architect will perform no more than ONE (1) inspection to determine whether the Work has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect, Engineer, Consultant or service provider for any additional inspections.
- ...

§ 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.~~

§ 9.8.6 Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

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§ 9.9.3 ~~Unless otherwise agreed upon, expressly agreed upon in writing,~~ partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

...

§ 9.10.1 ~~Upon receipt of the Contractor's 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~~ When all of the Work is finally completed and the Contractor is ready for a final inspection it shall notify the Owner and the Architect thereof in writing. Thereupon, the Architect and Owner will make final inspection of the Work and, if the Work is complete in full accordance with the Contract Documents and this Contract has been fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, 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 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, certifying to the Owner that the Project is complete and the Contractor is entitled to the remainder of the unpaid Contract Price, less any amount withheld pursuant to this Contract. Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work has attained Final Completion in accordance with the Contract Documents. If the Architect is unable to issue its final Certificate for Payment and is required to repeat its final

inspection of the Work, the Contractor shall bear the cost of such repeat final inspection(s) which cost may be deducted by the Owner from the Contractor's final payment.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills, ~~The Contractor shall not be entitled to final payment unless and until it submits to the Architect its affidavit that the payrolls, invoices for materials and equipment, and other indebtedness liabilities~~ 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 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) 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, other data establishing payment or satisfaction of obligations, such as 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 ~~have been fully paid or otherwise satisfied; releases and waivers of liens from all Subcontractors of the Contractor and of any and all other parties required by the Architect or the Owner; such other provisions as Owner may request; and consent of Surety to final payment.~~ If any third party fails or refuses to provide a release of claims or waiver of lien as required by Owner, the Contractor shall 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. ~~discharge any such lien or indemnify the Owner from liability~~

§ 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 ~~it~~ The Owner shall make final payment of all sums due the Contractor not more than thirty-one (31) days after the Architect's execution of a final Certificate for Payment. The Final Payment shall not constitute a waiver of Claims. ~~any claims by the Owner.~~

§ 9.10.4 The making of final payment shall constitute a waiver of 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.~~ [Paragraph Deleted.]

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§ 9.11 AUDIT

Contractor agrees to maintain adequate books, payrolls and records satisfactory to the Owner in connection with any and all Work performed hereunder. Contractor agrees to retain all such books, payrolls and records (including data stored in computer) for a period of not less than three (3) years after completion of the Work. At all reasonable times, Owner and its duly authorized representatives shall have access to all personnel of Contractor and all such books, payrolls and records, and shall have the right to audit same.

§ 9.12 In addition to any liquidated damages payable to the Owner by the Contractor, if: (1) the Architect is required to make more than one (1) inspection for Substantial Completion; (2) the Architect is required to make more than 1 inspection for Final Completion; or (3) the Work is not substantially complete within thirty (30) days after the date established for Substantial Completion in the Contract Documents; the Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections or services.

- ...
- .1 Contractor's employees, agents, and Subcontractors shall not perform any service for Owner while under the influence of alcohol or any controlled stance. Contractor, its employees, agents, and Subcontractors shall not use, possess, distribute, or sell illicit or unprescribed controlled drugs or drug paraphernalia, or misuse legitimate prescription drugs while performing the Work. Contractor, its employees, agents, and Subcontractors shall not use, possess, distribute, or sell alcoholic beverages while performing the Work.
 - .2 Contractor has adopted or will adopt its own policy to assure a drug and alcohol free work place while performing the Work.
 - .3 Contractor will remove any of its employees from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such employee, 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 employees from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, Contractor's employees 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 employee was in compliance with this contract. Contractor will not use an employee to perform the Work who either refuses to take, or tests positive in, any alcohol or drug test.
 - .4 Contractor will comply with all applicable federal, state, and local drug and alcohol related laws and regulations (e.g., Department of Transportation regulations, Department of Defense Drug-Free Workforce Policy, Drug-Free Workplace Act of 1988).
 - .5 Owner has also banned the presence of all weapons on the Project site, whether the owner thereof has a permit for a concealed weapon or not.
- ...

- .1 employees on the Work, school personnel, students and other persons on the Owner's premises and other persons who may be affected thereby; thereby, which protection shall include the installation of fencing between the Work site and the occupied portion of a connecting or adjacent educational facility;
 - .3 other property at the site or adjacent thereto, such as fences, trees, shrubs, lawns, walks, athletic fields and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- ...

§ 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 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 property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 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~~ 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. **CONTRACTOR SHALL HOLD OWNER HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO ANY PROPERTY THAT IS ON OR OFF THE SITE AND/OR IN TRANSIT AS REFERRED TO IN CLAUSE 10.2.1.2 EVEN IF SUCH LOSS OR DAMAGE RESULTS FROM OWNER, OWNER'S CONSULTANT'S, OR ARCHITECT'S NEGLIGENCE. AS TO PROPERTY REFERRED TO IN CLAUSE 10.2.1.3, CONTRACTOR SHALL HOLD OWNER FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE CAUSED IN WHOLE OR IN PART BY THE CONTRACTOR, ANY SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM, ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH DAMAGE IS CAUSED IN PART BY THE NEGLIGENT ACTS OR OMISSIONS OF THE OWNER, OWNER'S CONSULTANTS OR ARCHITECT. THE FOREGOING OBLIGATIONS OF THE CONTRACTOR ARE IN ADDITION TO HIS OBLIGATIONS UNDER SECTION 3.18; PROVIDED THAT WHERE THE NEGLIGENCE OF OWNER OR ARCHITECT IS A CONCURRING CAUSE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER, ARCHITECT AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER, ARCHITECT AND CONTRACTOR ARE ALL PARTIES.**

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If either party 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21+3 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. No provision of the Contract Documents shall waive Owner's immunity under the Texas Tort Claims Act, Texas Civil Practice and Remedies Code, Chapter 101.

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§ 10.3.3 ~~To the fullest extent permitted by law, extent permitted by the laws and Constitution of the State of Texas, 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. Notwithstanding anything to the contrary contained in this Section 10.3.3, the agreement of the Owner to indemnify, defend and hold harmless the parties described in this Section shall not extend or apply to claims, damages, losses, expenses or liabilities related to, created or caused in whole or in part by a party indemnified hereunder; it being agreed and understood that the Owner and any party so indemnified shall each bear liability for its own negligent acts or omissions, and that such indemnity shall extend only to liability for the negligent acts and omissions of the Owner.~~

...

§ 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.~~ [Paragraph Deleted.]

...

§ 11.1.1 ~~The Contractor 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 carry and maintain in force insurance described~~

below. Prior to execution of the Contract, the Contractor shall procure insurance coverage in the types and amounts as follows:

Workmen's Compensation:

(Including Waiver of Subrogation Endorsement)

All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted.

Employer's Liability:

\$1,000,000.00

Commercial General Liability:

Each Occurrence
General Aggregate

\$1,000,000.00
\$2,000,000.00 (A Designated Construction Project General Aggregate Limit shall be provided)

Personal & Advertising Injury
Products and Completed Operations

\$1,000,000.00 each person
\$1,000,000.00 (for one (1) year, commencing with issuance of final Certificate for Payment)

Property Damage

Independent Contractors
Contractual Liability

\$1,000,000.00 each occurrence
\$2,000,000.00 aggregate
(Same limits as above)
(Same limits as above)

Automobile Liability:

Bodily Injury/Property Damage
Property Damage

\$1,000,000.00 combined single limit
\$1,000,000.00 each occurrence

Umbrella or Excess Liability

\$5,000,000.00 each occurrence/aggregate

~~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.~~

All Risk Builders Risk against the perils of fire, lightening, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.

§ 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.~~ required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner. The Owner's Representative will contact the State Board of Insurance to confirm that the issuing companies are admitted and authorized to issue such policies in the State of Texas.

§ 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.~~ The General Liability and Automobile so issued in the name of Contractor shall also name the Owner as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary and non-contributing. The Commercial General Liability coverage provided by Contractor

shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.

§ 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 of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of 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 notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage. If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payment made by the insurance carrier on claims paid by this insurance. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.1.5 The insurance required by Section 11.1.1 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. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1.6 Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Section 11.1.1. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance and the provisions of Section 11.1.8 hereof shall apply.

§ 11.1.7 Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements pursuant to Section 11.1.6 hereof have been received by Owner and the Architect has issued a written notice to proceed.

§ 11.1.8 As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for any part or all of the insurance required by Section 11.1 hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.

§ 11.1.9 Workers' Compensation Insurance Coverage.

.1 Definitions:

.1.1 Certificate of coverage ("Certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the division, or a coverage agreement (DWC Form-81, DWC Form-82, DWC Form-83, or DWC Form-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project.

.1.2 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.

.1.3 Persons providing services on the Project ("subcontractor" in Texas Labor Code §406.096). Includes 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 contracts directly with the Contractor and 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 which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project.

- "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.
- .2 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, Section 401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.
- .3 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the contract.
- .4 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.
- .5 The Contractor shall obtain from each person providing Services on a Project, and provide to the Owner:
- .5.1 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
- .5.2 no later than seven (7) 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.
- .6 The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.
- .7 The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten (10) 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.
- .8 The Contractor shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, 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.
- .9 The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:
- .9.1 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, Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;
- .9.2 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;
- .9.3 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;
- .9.4 obtain from each other person with whom it contracts, and provide to the Contractor:
- (a) a certificate of coverage, prior to the other person beginning work on the Project; and
- (b) 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;
- .9.5 retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
- .9.6 notify the Owner in writing by certified mail or personal delivery, within ten (10) 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
- .9.7 contractually require each person with whom it contracts, to perform as required by Subparagraphs .9.1 - .9.7 with the certificates of coverage to be provided to the person for whom they are providing services.
- .10 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 Texas Department of Insurance, 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.

- .11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the Owner. [28 TAC §110.110(c)(7)]

§ 11.1.10 The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Section 3.18.3. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Section 11.1.10.

§ 11.2 Owner's Insurance [Paragraph Deleted.]

§ 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.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation [Paragraph Deleted.]

§ 11.3.1 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 (1) even though that person or entity would otherwise have a duty of indemnification,

contractual or otherwise, (2) even though that person or entity 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.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, 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.

§ 11.4 PERFORMANCE BOND AND PAYMENT

§ 11.4.1 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.

§ 11.4.2 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional obligee.

§ 11.4.3 The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. 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. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, 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, 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 an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.

The Sureties shall promptly file a signed copy of the Contract, Performance, and Payment Bonds with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or, in the case of a Construction Manager, as required by Article 8 of the AIA Document A133-2009.

§ 11.4.4 All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. 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 for review and decision.

§ 11.4.5 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.

§ 11.4.6 Upon the request in writing 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 permit a copy to be made.

§ 11.4.7 Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds

becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.

§ 11.4.8 By inclusion of this Section 11.4.8 in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

§11.5 Adjustment and Settlement of Insured Loss [Paragraph Deleted.]

§ 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 of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor 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 timely objects 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.

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§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time has been covered and the Architect has specifically requested to see such Work, or if any known deficiencies exist, or the Contract Documents specifically request inspection prior to its being covered, the Architect may request to see that Work and it shall be uncovered by the Contractor. If the Work is not in accordance with the Contract Documents, it must be corrected and covered at the expense of the Contractor. If the Work is according to the Contract Documents, the cost to restore cover on the Work is at the sole expense of the Contractor.

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§ 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.

§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one (1) year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

...

§ 12.2.6 Contractor shall (i) re-execute any parts of the Work that fail to conform with the requirements of this Agreement that appear in the progress of the Work; (ii) remedy any defects in the Work due to faulty materials or

workmanship which appear within a period of one (1) year from Substantial Completion of the Work hereunder, or within such longer period of time as may be set forth in the Drawings and Specifications or other Contract Documents; and (iii) 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 injured or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or 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 provisions of 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 Clause 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, an equitable deduction from the Contract Sum shall be made by 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.

§ 12.2.9 Contractor's express warranty herein shall be in addition to, and not in lieu of, any other remedies Owner may have under the Contract Documents, at law, or in equity for defective Work.

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The Contract shall be governed by the law of the 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. laws of the State of Texas, without regard to choice-of-law rules of any jurisdiction. The Contract is deemed performable entirely in the County in which the Project is located. Any litigation to enforce or interpret any terms of the Contract, or any other litigation arising out of or as a result of the Contract, shall be brought in the State courts of said County. No provision of this Agreement shall waive any immunity or defense.

...

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. 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. Except for tests, inspections and approvals required to be provided by the Contractor in the Contract Documents, the Owner will contract for, independently of the Contractor, the inspection services, the testing of construction materials engineering, and the verification testing services necessary for the acceptance of the Work by the Owner. The Contractor shall give timely notice to the persons or entities selected by the Owner of the need for such services. The Contractor shall give the Architect timely 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.

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Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate 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 in accordance with the Texas Prompt Payment Act, Texas Gov't Code Chapter 2251. Any such payment shall be deemed overdue on the thirty-first (31st) day after Owner receives the Contractor's Certificate for Payment from 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 (46th) day after Owner receives the 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 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 Contract Documents.

§ 13.7 CONTRACTORS RECORDS

§ 13.7.1 Contractor agrees to furnish Owner such information as may be available in Contractor's files and records for the Project for the purpose of aiding Owner in establishing a depreciation schedule for the Project or such portions thereof as Owner may determine.

§ 13.7.2 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll record, daily reports, diaries, logs, instructions, drawings, receipts, contracts, 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 ten (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.

§ 13.7.3 For all Change Orders, Allowances and expenditures from Contingency Funds, Contractor shall also maintain, in accordance with the provisions of Section 13.9.1, the following: contract files, including proposals of successful and unsuccessful bidders, bid recaps and contractor payments; original estimates; estimating Work sheets; general ledger entries detail 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.

§ 13.7.4 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 system shall be satisfactory to the Owner.

§ 13.7.5 Contractor shall keep all Construction Documents related to the Project, 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.

§ 13.7.6 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 overpayment within thirty (30) days of such audit findings, or the Owner, as its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.8 NO THIRD-PARTY BENEFICIARIES

There are no third-party beneficiaries to this agreement.

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§ 14.1.1 The Contractor may terminate the Contract if If the Work is stopped for a period of 30 thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work, for any of the following reasons: Work under direct or indirect contract with the Contractor, for any of the reasons set forth below, the Contractor may terminate the Contract upon twenty (20) days written notice to Owner and Architect if the Work is not allowed to commence within such period. The sole grounds for termination under this Subsection 14.1.1 are as follows:

...

- .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 the Owner has not made a payment on a 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. [Subsection Deleted.]

~~§ 14.1.2 The Contractor may terminate the Contract if, 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, 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-less,~~ the Contractor may terminate the Contract so long as Contractor has provided Owner and Architect with written notice of its intent to terminate in the event of additional delays of not less than twenty (20) days and has furnished written notice of termination to Owner and Architect no less than seven (7) days prior to the effective date of termination.

~~§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination, in an amount which would have been recoverable had the termination been for the Owner's convenience.~~

...

- ~~.2~~ fails to make payment to Subcontractors ~~or suppliers for materials or labor~~ in accordance with the respective agreements between the Contractor and the ~~Subcontractors or suppliers;~~ Subcontractors;

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- ~~.4~~ or any Subcontractor becomes insolvent, enters bankruptcy, receivership or other like proceeding; voluntary or involuntarily, or makes an assignment for the benefit of creditors; and the Contractor, within fifteen (15) days after receipt of notice from the Owner, fails to provide satisfactory evidence that the Contractor will either (i) perform the Work of such Subcontractor with the Contractor's own forces, in a timely manner, or (ii) replace the Subcontractor with another similarly qualified Subcontractor who is ready, willing and able to do such Subcontractor's Work in a timely manner
- ~~.5~~ fails to proceed continuously and diligently with the construction and completion of the Work; except as permitted under the Contract Documents; or
- ~~.6~~ otherwise is guilty of substantial breach of a provision of the Contract Documents. Documents

~~§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, 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:

...

- ~~.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.~~

In any such event, title to the Work and any products thereof, whether completed or partially completed, as well as all materials prepared, procured or set aside by the Contractor for use in the Work, shall vest in the Owner at the Owner's option, and the Owner may enter the Contractor's premises and remove the same therefrom. No election hereunder shall be construed as a waiver of any rights or remedies of the Owner with regard to any breach of the contract Documents.

...

~~§ 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.~~

...

§ 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, executed, for profit only on that portion of the Work executed, and reasonable costs of demobilization.

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§ 15.1.2 Time Limits on Claims

~~The Owner and Contractor shall commence all 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 case not more than 10 years after the date of 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.~~[Paragraph Deleted.]

...

§ 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 notice to the other party 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 either party under this Section 15.1.3.1 shall the Contractor, must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claim. Claims must be initiated by written notice to the Architect and the Owner.

...

§ 15.1.3.3 When Owner has an applicable claim for construction defects, Owner shall comply with the provisions of Texas Government Code Chapter 2272 related to the provision of notice of defects and the Contractor's or Architect's opportunity to cure.

...

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the ~~Initial Decision Maker's~~ Owner's decision, subject to the right of ~~either party the Contractor~~ to proceed in accordance with this Article 15. ~~The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.~~

...

§ 15.1.6.2 ~~If adverse~~ The Contractor shall be entitled to an extension of the Contract Time for delays or disruptions due to unusually inclement weather in excess of that normally experienced at the job site. Such extension of time will be granted only if such unusual inclement weather prevented the execution of Work on normal working days. Unusual inclement weather as used herein means unusually severe weather which is beyond the normal weather recorded and expected for the locality of the Work and/or the season or seasons of the year. Normal weather conditions shall be determined based upon information compiled from the records of the U.S. Weather Bureau Station at the location of the Work. If unusually inclement weather conditions are the basis for a Claim-claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, such conditions, the fact that the same could not have been reasonably anticipated, and the fact that they had an adverse effect on the scheduled construction. The Contractor shall bear the entire economic risk of all-weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect not later than the fifteenth day of the month following the month during which the delays or disruptions occurred.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. 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.~~

§ 15.1.7 CALCULATING CLAIMS FOR DAMAGES

Except as otherwise provided in this Agreement, in calculating the amount of any Claim recoverable by the Contractor, the following standards will apply:

- .1 No indirect or consequential damages will be allowed.
- .2 No recovery shall be based on a comparison of planned expenditures to total actual expenditures, or on estimated loss of labor efficiency, or on a comparison of planned manloading to actual manloading, or any other analysis that is used to show damages indirectly.
- .3 Damages are limited to extra costs specifically shown to have been directly caused by a proven wrong.
- .4 No damages will be allowed for home office overhead or other home office changes or any Eichlay formula calculation.

~~§ 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 Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect but excluding those arising under Section 10.3, shall be referred initially to the Architect for consideration and recommendation to the Owner. An initial recommendation by the Architect shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days Claim arising prior to the date final payment is due, unless thirty days have passed 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. Architect with no recommendation having been rendered by the Architect.~~

~~§ 15.2.2 The Initial Decision Maker Architect will review Claims and within ten (10) days of the receipt of a the 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. Contractor; (2) issue an initial recommendation; (3) suggest a compromise; or (4) advise the parties that the Architect is unable to issue an initial recommendation due to a lack of sufficient information or conflict of interest.~~

~~§ 15.2.3 In evaluating Claims, the 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 Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense. Following receipt of the Architect's initial recommendation regarding a claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Price and/or Contract Time. If no agreement can be reached either party may request mediation of the dispute pursuant to Article 15.~~

~~§ 15.2.4 If the 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 Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the 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. [Paragraph Deleted.]

§ 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. [Paragraph Deleted.]

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision. [Paragraph Deleted.]

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§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines. **WAIVER OF LIEN**
It is distinctly understood that by virtue of this Contract, no mechanic, contractor, materialman, artisan, or laborer, whether skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the building, or any of the improvements of whatever nature or kind so erected or to be erected by virtue of this Contract nor upon any of the land upon which said building or any of the improvements are so erected, built, or situated.

...

§ 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. In the event that the Owner or the Contractor shall contend that the other has committed a material breach of this Agreement, the party alleging such breach shall, as a condition precedent to filing any lawsuit, request mediation of the dispute.

§ 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. Request for mediation shall be in writing, and shall request that the mediation commence not less than thirty (30) or more than ninety (90) days following the date of the request, except upon agreement of both parties.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision. In the event the Owner and the Contractor are unable to agree to a date for the mediation or to the identity of the mediator or mediators within thirty days following the date of the request for mediation, all conditions precedent in this article shall be deemed to have occurred.

§ 15.3.4 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. Nothing herein shall preclude the

Owner or the Contractor from requesting that the Architect or one or more subcontractors be joined as parties to the mediation, to the extent allowed by their respective contracts..

§ 15.3.5 Unless otherwise agreed in writing by the Owner in the Owner's sole discretion, the Contractor may not bring a legal action against the Owner unless:

- .1** the Contractor has given written notice to the Owner of the Claim, dispute, or other matter giving rise to the legal action within ninety-one (91) days after the date of the start of the event giving rise to the Contractor's Claim, dispute or other matter, and
- .2** the legal action is brought within two (2) years and one (1) day after the date of the start of the event giving rise to Contractor's Claim, dispute or other matter.

§ 15.4 Arbitration/Immunity

§ 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. Contractor stipulates that Owner is a political subdivision of the State of Texas and, as such, may enjoy immunities from suit and liability under 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 provided by law.

§ 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. [Paragraph Deleted.]

§ 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. [Paragraph Deleted.]

§ 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. [Paragraph Deleted.]

§ 15.4.4 Consolidation or Joinder [Paragraph Deleted.]

§ 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.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Elisabeth Nelson, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 17:41:50 ET on 05/26/2020 under Order No. 9957725202 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SECTION 00 7343
WAGE RATE REQUIREMENTS

WAGE RATES

- A. 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:

(see attached table)

MIDLOTHIAN INDEPENDENT SCHOOL
DISTRICT PREVAILING WAGE SCHEDULE
(No Fringes)

General Decision Number: TX170296 04/14/2017 TX296

Superseded General Decision Number: TX20160296

State: Texas

Construction Type: Building

County: Ellis County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017
1	01/27/2017
2	04/07/2017
3	04/14/2017

ASBE0021-011 06/01/2016

Rates

ASBESTOS WORKER/HEAT & FROST
INSULATOR (Duct, Pipe and
Mechanical System Insulation).....\$ 24.32

* BOIL0074-003 01/01/2017

Rates

BOILERMAKER.....\$ 28.00

CARP1421-002 04/01/2016

Rates

MILLWRIGHT.....\$ 26.60

ELEV0021-006 01/01/2017

Rates

ELEVATOR MECHANIC.....\$ 38.77

FOOTNOTES:

A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

B. New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Veterans Day.

ENGI0178-005 06/01/2014

Rates

POWER EQUIPMENT OPERATOR

(1) Tower Crane.....\$ 29.00

(2) Cranes with Pile

Driving or Caisson

Attachment and Hydraulic

Crane 60 tons and above.....\$ 28.75

(3) Hydraulic cranes 59

Tons and under.....\$ 27.50

IRON0263-005 06/01/2015

Rates

IRONWORKER (ORNAMENTAL AND
STRUCTURAL).....\$ 23.00

PLUM0100-005 07/01/2016

Rates

HVAC MECHANIC (HVAC Unit
Installation Only).....\$ 27.11
PIPEFITTER (Excludes HVAC
Pipe Installation).....\$ 27.11

SUTX2014-022 07/21/2014

Rates

BRICKLAYER.....\$ 19.89

CARPENTER, Excludes Drywall
Hanging, Form Work, and Metal
Stud Installation.....\$ 16.62

CAULKER.....\$ 15.16

CEMENT MASON/CONCRETE
FINISHER.....\$ 13.21

DRYWALL HANGER AND METAL
STUD INSTALLER.....\$ 15.42

ELECTRICIAN (Alarm
Installation Only).....\$ 20.93

ELECTRICIAN (Communication
Technician Only).....\$ 17.62

ELECTRICIAN (Low Voltage
Wiring Only).....\$ 17.97

ELECTRICIAN, Excludes Low
Voltage Wiring and Installation of
Alarms/Sound and Communication
Systems.....\$ 20.65

FORM WORKER.....\$ 12.13

GLAZIER.....	\$ 16.55
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine).....	\$ 10.04
INSTALLER - SIDING (METAL/ALUMINUM/VINYL).....	\$ 14.74
INSTALLER - SIGN.....	\$ 15.61
INSULATOR - BATT.....	\$ 13.00
IRONWORKER, REINFORCING.....	\$ 12.37
LABORER: Common or General.....	\$ 12.97
LABORER: Mason Tender - Brick.....	\$ 10.54
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.75
LABORER: Pipelayer.....	\$ 13.00
LABORER: Plaster Tender.....	\$ 12.22
LABORER: Roof Tearoff.....	\$ 11.28
LABORER: Landscape and Irrigation.....	\$ 11.09
LATHER.....	\$ 16.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 12.83
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 13.93
OPERATOR: Bulldozer.....	\$ 18.29
OPERATOR: Drill.....	\$ 15.69
OPERATOR: Forklift.....	\$ 13.21
OPERATOR: Grader/Blade.....	\$ 12.96

OPERATOR: Loader.....\$ 13.46
 OPERATOR: Mechanic.....\$ 17.52
 OPERATOR: Paver (Asphalt, Aggregate,
 and Concrete).....\$ 18.44
 OPERATOR: Roller.....\$ 15.04
 PAINTER (Brush, Roller and Spray),
 Excludes Drywall Finishing/Taping.....\$ 13.21
 PAINTER: Drywall
 Finishing/Taping Only.....\$ 13.76
 PLASTERER.....\$ 15.75
 PLUMBER (HVAC Pipe
 Installation Only).....\$ 22.16
 PLUMBER, Excludes HVAC Pipe
 Installation.....\$ 22.31
 ROOFER.....\$ 17.19
 SHEET METAL WORKER (HVAC Duct
 Installation Only).....\$ 20.88
 SHEET METAL WORKER, Excludes
 HVAC Duct Installation.....\$ 24.88
 SPRINKLER FITTER (Fire Sprinklers).....\$ 22.94
 TILE FINISHER.....\$ 11.22
 TILE SETTER.....\$ 14.25
 TRUCK DRIVER: 1/Single Axle
 Truck.....\$ 16.40
 TRUCK DRIVER: Dump Truck.....\$ 12.39
 TRUCK DRIVER: Flatbed Truck.....\$ 19.65
 TRUCK DRIVER: Semi-Trailer Truck.....\$ 12.50

TRUCK DRIVER: Water Truck.....\$ 12.00

TRUCK DRIVER.....\$ 16.15

WELDERS - Receive rate prescribed for craft
performing operation to which welding is
incidental.

=====

**SECTION 01 1100
SUMMARY OF WORK**

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. The "Project" of which the "Work" of this Contract is a part, is titled New Randall Hill Support Center for Midlothian ISD and is composed of a new pre-engineered metal building shell and related site work located in Midlothian, Texas.
2. The "Work" of this Contract is titled New Randall Hill Support Center and is defined in the Contract Documents to include, but not necessarily to be limited to:
 - a. New pre-engineered building shell, including all mechanical, electrical, plumbing, and general construction work.
3. Related Work:
 - a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
 - b. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

B. Other Work:

1. Owner (if required by Municipality, State or Federal requirements) shall provide evidence to the municipality permitting the project that an asbestos survey has been completed by a person licensed under the Texas Asbestos Health Protection Act to perform such a survey.
2. The architect has no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials or toxic substances in any form at the project site.
3. The architect is not required to execute certifications that would require knowledge, services or responsibilities beyond the scope of the architectural service agreement.
4. The architect assists the owner in the owner's responsibility to obtain applicable permits for demolition and construction.
5. Contractor to review and familiarize themselves with owner's Asbestos survey and plan and shall inform every worker that they use on this project as to the availability of these surveys and plans prior to starting any work.

END OF SECTION

**SECTION 01 1400
WORK RESTRICTIONS**

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Contractor shall comply with the following requirements concerning scope and work restrictions.
 - 2. If the Contractor believes that meeting the restrictions in this section would cause a delay to the intended schedule, they shall issue an RFI requesting specific modifications to that specific Work Restriction that would permit construction to continue without delay and indicating the reasons for the request. If construction proceeds without meeting any of the restriction requirements or obtaining approval for a modification of these requirements, the Contractor shall be responsible for all costs associated with removing and replacing all construction that occurred in violation of the Work Restrictions, if directed to by the Architect, without any increase in approved construction costs or schedule for the project.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
 - 2. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.
- C. Specific Project Restrictions:
 - 1. Contractor shall be advised that the school will be operating during the duration of this project.
 - 2. Contractor shall coordinate with the Owner any activities which will disrupt normal school operations.
 - 3. Before project completion and a certificate of occupancy is issued, Contractor shall provide fully established grass at locations including but not limited to all disturbed areas, under items that have been stored on site , construction trailers and storage units.
- D. Project restrictions related to Quality Control
 - 1. The Contractor shall not be permitted to begin work on-site (other than job trailer installation and/or removal of on-site vegetation) until the Contractor has scheduled and hosted a "Foundation Pre-Construction" meeting (in person or on a conference call) with the Architect's Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), a representative of the Structural Engineer, the Superintendent of Construction, Contractor's Project Manager, and all foremen for subcontractors with work related to the foundation.
 - 2. The Contractor shall not be permitted to continue work on-site (other than job trailer installation and/or removal of on-site vegetation) more than one week after the Foundation Pre-Construction meeting (or an alternative deadline if requested by the Contractor and approved by the Architect) unless:
 - a. The Contractor has obtained correspondence from the Geotechnical Engineer indicating that the Geotechnical Engineering firm has reviewed all relevant Construction Documents for conformance with their recommendations and indicated any portions of these documents which, in their opinion, do not conform with their recommendations. The term "relevant Construction Documents" shall include this Project Manual, all construction drawing sheets, any addenda issued before proposals are received, any addenda issued after proposals are received but before an Owner/Contractor Agreement is fully executed, and any changes in scope

- associated with a Request For Proposal (RFP) that is approved before construction begins.
- b. The Contractor has obtained verification in writing from the Architect that the SITA has issued one or more acceptable statements indicating the SITA will be performing the scope of work for the SITA specified in Section 01 4533 and that the SITA as well as all SITA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533.
 - c. The Contractor has obtained verification in writing from the Mechanical and Electrical Engineers that the CxA has issued one or more acceptable statements indicating the CxA will be performing the scope of work for the CxA specified in Section 01 4533 and that the CxA as well as all CxA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533. This verification shall also confirm that the specified commissioning services on this project comply with the applicable version of the International Energy Conservation Code (IECC).
 - d. The Contractor has submitted to Midlothian ISD, the Building Official, and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control". (Refer to Section 01 4533 for suggested language.)
 - e. The Contractor has confirmed in writing to the Architect that the Contractor has scheduled and hosted a "Quality Control Pre-Construction Meeting", following the agenda in Section 01 4533, listing the names and project roles of all attendees.
- 3. The Contractor shall not be permitted to drill any holes for actual piers until verifying in writing that the Structural Engineer has either determined that the conditions encountered in the Test Pier Hole report are generally consistent with those required for proposal purposes, or issued modifications to the pier design. Proposers shall assume for proposal purposes that they shall not be permitted to drill holes for actual piers until one (1) calendar week after the Test Pier Holes are drilled. It is hoped that this will take less time. This paragraph shall not apply to light pole bases.
 - 4. The Contractor shall not be permitted to apply for a Certificate of Occupancy until the Contractor has obtained a copy of each Final Report of Quality Control from every firm providing quality control services where required by the Final Report provisions of Section 01 4533 and, in addition, the Contractor has submitted to the AHJ the Final Report of Quality Control from the SITA, the Final Report of Quality Control from the CxA and the Final Report of Quality Control from the Code-Required Structural Observer. (The Contractor shall submit reports from the other quality control personnel if requested by the AHJ.)
- E. Project Restrictions related to the General Framing Preconstruction Meeting
 - 1. The Contractor shall not be permitted to install any portion of the superstructure until the Contractor has scheduled and hosts a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the SITA, the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.
 - F. Within 1 week after the Quality Control Pre-Con, the Contractor is required to send an Outlook Calendar appointment for a meeting with the Contractor, the SITA, the CxA, and a representative of the Architect to discuss completion of quality control documentation. This meeting shall be scheduled to occur after quality control tasks are complete and before punchlist. See Section 01 3000 and 01 4533 for additional information.

END OF SECTION

**SECTION 01 2100
ALLOWANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowance.
- C. Payment and modification procedures relating to allowances.

1.02 CASH ALLOWANCES

- A. Cash Allowances shall be included in the contract sum.
- B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Cash Allowance. These costs shall be included in base contract sum unless noted otherwise
- C. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing. These costs shall be included in base contract sum unless noted otherwise.
- D. Architect Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- E. Contractor Responsibilities:
 - 1. Assist Architect in selection of products, suppliers, and installers.
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
- F. Differences in costs will be adjusted by Change Order.
- G. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

1.03 CONTINGENCY ALLOWANCE

- A. Contingency Allowance shall be included in the contract sum.
- B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. Owner's Contingency Allowance: Include the amount of 2% of the total contract price for use upon Architect's and Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 2200
UNIT PRICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- E. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- F. Measurement by Area: Measured by square dimension using mean length and width or radius.
- G. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

1.04 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. The following unit prices may apply on any additions to, or deductions from the work, which prices shall include overhead, profit, taxes, and all other related costs. The unit prices shall be installed, in-place prices for materials/systems as specified. The quoted unit prices will be valid, and the quoted unit prices will be in force on any work. A singular cost shall be provided below to be used for both additions and deductions. If different prices are provided for additions and deductions the average of the absolute values will be used. The materials and work shall be in compliance with the specifications. The Contractor shall not be compensated for work that is not authorized by the Architect or Owners Laboratory (e.g. over drilling of piers and additional concrete and reinforcement for over drilled piers)

1.05 SCHEDULE OF UNIT PRICES

UNIT PRICING MATERIAL/SYSTEM	UNITS	COST (\$)/UNIT
Excavation (Dirt or Caliche)	Cubic Yard	
Excavation (Rock)	Cubic Yard	
Backfilling (On Site)	Cubic Yard	
Reinforcing Steel, Straight or Bent	Pound	
Structural Concrete	Cubic Yard	
Uncased Drilled Piers -		

Complete including reinforcing, concrete, accessories and drilling		
24" Diameter	Lineal Foot	_____
Cased Drilled Piers - Complete including reinforcing, concrete, accessories, drilling and casing		
24" Diameter	Lineal Foot	_____

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Schedule of Values.
- E. Progress meetings.
- F. Submittal Schedule.
- G. Submittals for review and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.
- J. Progress Payments.
- K. Contractor's Daily Field Report.
- L. Request For Information.

1.02 RELATED REQUIREMENTS

- A. Section 01 1100 - Summary of Work
- B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
- C. Section 01 6000 - Product Requirements: General product requirements.
- D. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- E. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. The Notice to Proceed shall not be issued by the Architect until the Agreement (or Amendment, if Contractor is a Construction Manager at Risk) including final GMP and all exclusions or other post Proposal agreements, have been signed and approved as well as all required payment and performance bonds and insurance, and furnished to the Architect.
- B. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- C. Make the following types of submittals to Architect:
 - 1. Requests for Information (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.
 - 12. Warranty request and corrective action descriptions.

1.04 SPECIAL CONDITIONS

- A. The successful Proposer will be furnished, free of charge, ten (10) copies of the Drawings and Project Manuals and will be furnished, at actual cost of reproduction born by the successful Proposer, as many additional copies as he may require.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. This includes submittals for review, information, requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), field reports and meeting minutes, preliminary closeout for review, final project record documents closeout submittal and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Architect are required to use this service at no cost to the Contractor.
 - 3. It is Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed.
 - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
 - 1. Newforma Info Exchange: <https://newforma.huckabee-inc.com/UserWeb>
 - a. Contractor will receive a username and password upon award of the project.
- C. Training: External user tutorials are available at www.newforma.com/external-users-tutorials. The awarded General Contractor will be required to become familiar with the program prior to Notice to Proceed being issued.
- D. Project Closeout: Architect will determine when to terminate the service for the project. Contractor is responsible for providing digital and hard copies of the final project record documents closeout submittal to the Owner. Should Owner forgo hard copies, Contractor shall submit a credit to the Owner.

3.02 PRECONSTRUCTION MEETINGS

- A. A Kick-Off Pre-Construction meeting will be scheduled to be held upon notification by the Architect.
 - 1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
 - 2. The Architect will advise other parties, including the Owner, and request their attendance.
 - 3. The Architect shall arrange, preside, and record the minutes of the pre-construction meeting.
 - 4. A pre-construction meeting agenda will be issued by the Architect at the meeting.
 - 5. Agenda items to be discussed include:
 - a. Self introductions
 - b. Design concept, scope, and objectives
 - c. Communications
 - d. Contractor's responsibilities
 - e. Documentation and notification
 - f. Progress Meetings
 - g. Submittals/Substitutions
 - h. Project Administration

- i. Project Closeout
 - j. Warranty Phase
- B. Foundation Pre-Construction Meeting
 - 1. Before beginning any work on-site (other than job trailer installation and/or removal of on-site vegetation) the Contractor shall schedule and host a "Foundation Pre-Construction" meeting (in person or on a conference call) with the Architect's Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), the Code-Required Structural Observer, a representative of the Structural Engineer, the Superintendent of Construction, Contractor's Project Manager, and all foremen for subcontractors with work related to the foundation.
- C. Quality Control Pre-Construction Meeting
 - 1. Within one week after the "Foundation Pre-Construction Meeting", the Contractor shall schedule and host a "Quality Control Pre-Construction Meeting" following the Agenda in Section 01 4533.
- D. Framing Pre-Construction Meeting: The Contractor shall not be permitted to install any portion of the superstructure above the foundation until the Contractor has scheduled and held a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the Special Inspection and Testing Agency (SITA), the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.

3.03 SCHEDULE OF VALUES

- A. Within twenty-one (21) calendar days following Notice to Proceed, the Contractor shall submit a Schedule of Values (using the breakdown of the Construction Schedule activities) for review by the Owner's Representatives. The Schedule of Values will allocate a dollar value (cost) for each activity of the Construction Schedule. Each activity cost allocation shall include a labor, equipment and material cost and a pro rata contribution to overhead and profit. The sum of all activity costs shall be equal to the total Contract Sum. Each activity cost shall be coded with a cost code corresponding to the subcontractor responsible for the Work so that subtotals for each division of the Work can be prepared.
- B. Within thirty (30) calendar days following Notice to Proceed, the Contractor shall participate in a conference with the Owner's Representatives to review, evaluate and approve the Schedule of Values. The approved Schedule of Values shall, in the best judgment of the Contractor, the Project Manager, and the Architect represent a fair, reasonable, and equitable dollar (cost) allocation for each activity on the Construction Schedule.

3.04 PROGRESS MEETINGS

- A. Schedule and administer jobsite meetings throughout progress of the Work in intervals agreed to at the Preconstruction Meeting.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Agendas and prior meeting minutes shall be distributed 24 hours prior to meeting.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers (as invited), Owner, Architect, as appropriate to agenda topics for each meeting. Representation should be consistent throughout project.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will 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. Status of Request for Information (RFI).
 14. Status of Request for Change Proposal (RFP).
 15. Other business relating to work.
 16. Construction forecast for 3 weeks.
 17. Weather Delay Requests.
 18. Quality Control.
- E. Record minutes and distribute typewritten copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.
1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
 2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
 3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

3.05 SUBMITTAL SCHEDULE

- A. Within twenty-one (21) business days following the Notice to Proceed, the Contractor shall submit a Submittal Schedule for review by the Architect and Owner. This schedule shall coincide with the approved Construction Schedule accommodating the submittal review and material selection times as required by Architect, Owner or Owner's Representatives. In the event a submittal schedule is not provided and approved by the Architect, Owner, or the Owner's Representative at the submission of the 2nd pay application, the 2nd pay application will be held until the submittal schedule is complete as noted above.
- B. This schedule shall list all required submittals, product data, and samples for the project. Each item to be submitted shall include the date to be submitted, review time and the scheduled installation date. All submittals shall be listed and sequenced within the Submittal Schedule in accordance with the approved Construction Schedule.
- C. The Architect and Owner will review the Submittal Schedule, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised Submittal Schedule to the Architect and Owner within fourteen (14) business days and thereafter until approved,
- D. Submittals, product data and samples submitted out of sequence to the approved Submittal Schedule or Construction Schedule will be subject to return as unchecked and required to be resubmitted at a date coinciding with these schedules. The Submittal Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract required Milestone and Completion date. Omissions and errors in the approved Submittal Schedule shall not excuse the Contractor from providing required submittals, product data or samples, nor excuse the Contractor from meeting the Contract required Milestones and Completion date.

3.06 SUBMITTAL DEFINITIONS AND REQUIREMENTS

- A. Shop Drawing
1. Shop drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.

- B. Product Data
 - 1. Product data are illustrations, standard schedules, performance charts, instructions, and brochures, furnished by the contractor to illustrate materials or equipment to illustrate some portion of the work.
- C. Sample
 - 1. Physical examples which illustrate materials for some portion of the work evaluated for product compliance.
- D. Color Sample
 - 1. Physical examples which illustrate color or texture for use in color selection.
- E. Submittal
 - 1. The submittal is the compilation of the shop drawing, product data, sample, color sample as requested by the specifications.

3.07 SUBMITTALS FOR REVIEW

- A. Submittals to the Architect which are not listed below will not be reviewed by the Architect and will not be returned to the Contractor. Submittals required by specification section which are not listed in this section shall be reviewed by the Contractor.
- B. The Architects review of the Contractors submittal shall be limited to examination of an initial submittal and one resubmittal. The Architect's review of additional submittals, beyond that of the initial and resubmittal, will be made only with prior written approval of the Owner after notification by the Architect.
- C. Contractors review of submittals shall be consistent with A201 – General Conditions. Areas of deviation from the Contract Documents will be represented by revision clouds, Green in color, made by the General Contractor on the associated PDF document. In the event there are no clouded areas identified, it can be assumed that the associated submittal has been reviewed in full by the General Contractor and are deemed approved. No further review by the Architect is required.
- D. Samples
 - 1. Contractor shall submit all products which require a color selection. Contractor shall only submit actual product sample. Remainder of submittal shall be retained by contractor. Refer to color sample procedures below.
 - 2. Provide sample identical to the precise article proposed to be provided. If actual sample is not provided for substitution review, submittal will be rejected.
 - 3. Unless otherwise specified, submit one sample which will be retained by the Architect.
 - 4. Samples will be reviewed only for aesthetic, color, or finish selection.
- E. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Architect.
- F. Where required by specification sections, provide submittals to the Contractor for review and approval. Contractor shall maintain a copy of all submittals at the project site.
- G. Fax submittals are not acceptable.
- H. Upon request by the Architect, Contractor shall submit additional items as required.
 - 1. Only the following listed items shall be submitted to the Architect for review:
 - a. Section 03 3000 – Cast-In-Place Concrete
 - 1) Concrete Mix Designs
 - 2) Shop Drawings - Anchor bolt setting plan
 - 3) Shop Drawings - Grade beam, and slab reinforcing steel
 - 4) Shop Drawings - Construction joint plan
 - 5) Accessory products - Documentation indicated section 03 3000
 - b. Section 04 0511 - Mortar and Masonry Grout
 - 1) All proposed mortar and grout mix designs

- 2) Reinforcement Shop Drawings
- c. Section 05 7000 - Decorative Metal
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- d. Division 07 - Thermal and Moisture Protection
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- e. Division 08 - Openings
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- f. Section 13 3419 – Metal Building Systems
 - 1) Shop drawings with seal of professional engineer (Texas).
- g. Divisions 21, 22, 23, 26, 27, 28
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- h. Division 31 - Earthwork
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- i. Division 32 - Exterior Improvements
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- j. Division 33 - Utilities
 - 1) Product Data – all components required per spec section.
 - 2) Shop Drawings – all components required per spec section.
- 2. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- 3. Samples will be reviewed only for aesthetic, color, or finish selection.
- 4. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".
- B. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.
- C. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.
- D. Submit Correction Punch List for Substantial Completion.
- E. Submit Final Correction Punch List for Substantial Completion.
- F. Submit for Owner's benefit during and after project completion.
- G. See Section's 01 7000 and 01 7800 for additional details.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

- B. Extra Copies at Project Closeout: See Section 01 7800.
- C. Samples: Submit one sample as specified in individual specification sections which will be retained by Architect. All other samples required by the individual specification section shall be retained by the Contractor.
 - 1. After review, Contractor shall produce duplicates if needed for other purposes.
 - 2. The Architect's sample will not be returned to Contractor.

3.10 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Transmit using approved form.
 - 2. Acceptable Manufacturers
 - a. Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification. For additional manufacturers requiring approval, reference Section 01 6000 – Product Requirements.
 - 3. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.
 - 4. Submittals shall be numbered as follows:
 - a. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
 - b. Example - 1234-01-01 Tiling 09 3000 - 5.
 - c. When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
 - d. On re-submittals, cite the original submittal number for reference.
 - e. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
 - f. When multiple projects are administered under one contract, contractor shall submit separate submittals for each project. Failure to submit separately will result in a rejected submittal review.
 - g. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
 - 1) Partial submittals may be rejected as not complying with the provisions of the Contract.
 - 2) The Contractor may be held liable for delays so occasioned.
 - 3) Multiple projects bid under a single prime shall package submittals separately for each project.
 - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 - 7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
 - b. Deliver physical sample submittals to Architect at 801 Cherry Street, Suite 500, Fort Worth, Texas 76102.
 - 8. Schedule submittals to expedite the Project, and coordinate submission of related items.

- a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.
9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
10. Provide space for Contractor and Architect review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Revisions:
 - a. Make revisions required by the Architect.
 - b. If the Contractor considers any required revision to be a change, he shall so notify the Architect as provided for in the General Conditions.
 - c. Make only those revisions directed or approved by the Architect.
 - d. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
15. Submittals not requested will not be recognized or processed.
- B. Shop Drawing Procedures:
 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.11 ELECTRONIC DRAWING FILE REQUEST

- A. Upon Award of Contract:
 1. At the pre-construction meeting, Awarded Prime Contractor shall bring the executed electronic file release form for the original contract documents. The agreement forms can be found at the end of this Section. Upon the Prime Contractor executing and submitting the agreement to the Architect, the Architect will provide the Contractor one (1) electronic copy of the Revit® BIM Model file(s) **at no charge** within five (5) working days. **Note that CAD files associated with the work can be accessed and exported from the model provided to the General Contractor through the use of Revit® software; therefore, individual CAD files will not be provided by the Architect or its consultants.** Files and Formats to be as follows
 - a. Civil: Overall master file in AutoCAD format.
 - 1) Overall site plan with utility and grading information
 - 2) All details, detail annotation and references are omitted and not part of the AutoCAD file.
 - b. Structural: BIM Model (Revit) and associated working plan views.
 - 1) Plan views contain overall and enlarged plan section view set up of foundation, second floor framing and roof framing only. All plan views contain grids, dimensions and general annotation.
 - 2) All details, detail annotation and references are omitted and not part of the model file.
 - c. Architectural: BIM Model (Revit) and associated working plan views.
 - 1) Plan views contain overall and enlarged section plan view set up of floor plans, floor patterns, reflected ceiling and roof plans only. All plan views contain grids, dimensions, room names and general annotation.
 - 2) Reflected Ceiling Plans contain ceiling grids and types only. Lighting and Mechanical are provided as part of the MEP model.

- 3) Roof Plans contain grids and general annotation only. Mechanical is provided as part of the MEP model.
 - 4) All details, detail annotation and references are omitted and not part of the model file.
 - d. Mechanical, Electrical and Plumbing: BIM Model (Revit) and associated working plan views.
 - 1) Plan views contain overall and enlarged section plan view set up of mechanical, electrical lighting, electrical power and plumbing plans only.
 - 2) All details, detail annotation and references are omitted and not part of the model file.
 - e. Technology: BIM Model (Revit) and associated working plan views.
 - 1) Plan views contain overall and enlarged section plan view set up showing all device locations and general annotation.
 - 2) All details, detail annotation and references are omitted and not part of the model file.
 - 3) Electronic files for Technology drawings will only be released to the Prime Contractor but will require signatures from both the Prime Contractor and the Technology Subcontractor on an additional Technology/Security release form.
2. The Revit® file provided to the Awarded Prime Contractor is NOT FOR CONSTRUCTION PURPOSES, but for convenience only. This BIM Model will consist of the original model utilized for base bid. It is the responsibility of the Awarded Prime Contractor to coordinate all accepted alternates, addenda, Requests for Information, Proposal Requests and any other changes realized during construction. The Architect will not provide up-to-date drawings sets or updated BIM Models to the Awarded Prime Contractor unless otherwise stated within the Owner/Architect agreement. If “conformed” documents are required by the Owner/Architect agreement they will be provided in (PDF) Portable Document Format. Conformed Construction Documents are the Construction Documents modified to include any addenda issued during the bidding or negotiation process. The AIA does not use the terms “conform set” or “conformed set” in its documents.
3. TO THE EXTENT CONFORMED CONSTRUCTION DOCUMENTS ARE PROVIDED TO THE CONTRACTOR REGARDING THE PROJECT, THE FOLLOWING PROVISIONS SHALL APPLY:
 - a. The Conformed Construction Documents and related information contained therein, are provided for the Contractor’s (CONTRACTOR) convenience only, and does not relieve the CONTRACTOR from the requirements of Contract Documents which were issued for bid including any addenda. Specifically, to the extent that any discrepancy or conflict exists between the Issue for Bid documents including any Addenda (collectively referred to as the “Bid and Addenda Documents”) on the one hand, and the Conformed Construction Documents on the other, the Bid and Addenda Documents shall control unless otherwise specified in writing by the Architect. Field verification of existing and as-built conditions are required as part of the submittal process as specified in this Section 01 3000 Administrative Requirements and Section 01 7000 Execution and Closeout Requirements.
 - b. CONTRACTOR shall not to use such drawings, documents, or other data, in whole or in part, for any purpose or project other than the “PROJECT” in the preparation of shop drawings and other submittals.
 - c. CONTRACTOR acknowledges that such drawings, documents, and other data are subject to change or modification. CONTRACTOR shall be responsible for updating any drawings, documents or other data obtained prior to use by them for any purpose.

- d. Any Conformed Construction Documents, including any drawings, documents, or other data related thereto, are provided, "AS IS" without representation or warranty by Architect, either express or implied.
- e. CONTRACTOR acknowledges that Conformed Construction Documents are being provided by ARCHITECT as a courtesy to CONTRACTOR, at their specific request, and accordingly CONTRACTOR DOES HEREBY AGREE TO RELEASE, HOLD HARMLESS, DEFEND AND INDEMNIFY ARCHITECT AND THE MIDLOTHIAN ISD (OWNER), FROM ANY AND ALL CLAIMS, DEMANDS, OR CAUSES OF ACTION, WHICH CONTRACTOR, OR ANY THIRD PARTY, MAY HAVE BY REASON OF ANY INJURY OR DAMAGE SUSTAINED BY CONTRACTOR OR SUCH THIRD PARTY ARISING OUT OF OR IN ANY WAY RELATED TO THE USE OF SUCH CONFORMED CONSTRUCTION DOCUMENTS.

3.12 PROGRESS PAYMENTS

- A. The submission and approval of progress updates and the reports calculating the value of work done for any given pay period for each activity based on the percentage complete for that activity less the amount previously paid for past percentages complete and percent of retainage shall be an integral part and basic element of the application upon which Progress Payments shall be made pursuant to the provisions of the General Conditions and/or Supplementary Conditions. The Contractor shall be entitled to progress payments only as determined from the current updated and approved Construction Schedule. Contractor shall submit (3) three original sets for the first and final applications for payment, with all original signatures of AIA form G702 and G703 (form G702/CMA is not acceptable). All other payment applications shall be submitted electronically as described in paragraph 3.01 Electronic Document Submittal Service.
 - 1. The initial and subsequent cost reports which are developed from the schedule of values shall include the following activity information:
 - a. Activity number and activity description.
 - b. Percentage of value of work in place against Total Value.
 - c. Total cost of each activity.
 - d. Value of work in place this period.
 - e. Value of work in place to date.
 - f. Value of uncompleted work.
 - g. Value of stored material not in place.
 - h. The cost report will be submitted as supporting documentation to the Contractor's application for payment. The application for payment shall be submitted as required by the Contract Documents.
 - i. Identify scopes of work (campuses/buildings) when applicable with a clear and concise heading.
 - j. Separate scopes of work with the appropriate heading per the 2016 MasterFormat standard.
 - k. "Description of Work" shall be identified by specification number and heading per 2016 MasterFormat standard while separating the "Labor" and "Material" costs throughout each line item in the scope of Work.
 - l. Include all associated contingencies and allowances expenditures.
 - 1) All contingency and allowance expenditures shall be listed sequentially and follow the same guidelines as noted below. "Description of Work" shall reflect the pricing exercise and identify contingency or allowance.
 - 2) Reference the example AIA Document G703 found at the end of this Section.
 - m. In the event the Work is completed without the use of 100% of the the associated funds in the contract, column "H" or "Balance to Finish" shall represent the total dollar amount being credited back to the owner via AIA G701

3.13 CONTRACTOR'S DAILY FIELD REPORT

- A. Daily reports shall be used to record a chronological, day-to-day account of the work force, the respective activities performed, the weather conditions, and any specific events that take place on the Project.
- B. The Daily Report shall not be used as a communication tool. Any situations requiring specific action shall be brought to the attention of the appropriate party by means of written correspondence, memoranda, or meeting minutes.
- C. Photographs shall be used with the Daily Report to clarify or confirm statements and concerns.
- D. The Contractor shall produce a Daily Report including the following information:
 - 1. Date.
 - 2. Weather, temperature, wind, and precipitation.
 - 3. Number of workers on site, listed by Subcontractor and Trade.
 - 4. Material and equipment deliveries.
 - 5. Construction quantities placed.
 - 6. General description of the Work accomplished.
 - 7. Specific problems encountered.
 - 8. Meetings held.
 - 9. List of visitors to the site and their companies.
 - 10. Construction photographs.
- E. NOTE: Provide Owner with copies of signed Daily Report at weekly progress meetings.

3.14 REQUEST FOR INFORMATION

- A. Contract document interpretations or clarifications shall be submitted by the Contractor to the Architect in the form of a written request for information (RFI).
- B. RFIs shall be numbered sequentially and shall include only one question or related questions per RFI. If the Contractor's question or request for interpretation is already clearly defined or discernible in the contract documents, the RFI may be returned unanswered and the Architect may be entitled to additional compensation (from the Contractor) for review time.
- C. If the Contractor believes there may be additional contract cost or time incurred, it shall be stated in the RFI. If additional contract cost or time is required based on the RFI, the Architect will issue appropriate documentation for the proposed change. All changes in work shall be accomplished by approved change order only.
- D. The Architect will respond to the RFI in a reasonable and timely manner, within approximately seven (7) business days from the date the RFI is received and stamped by the Architect's office. No extension of contract cost or time will be allowed due to a delayed RFI submittal or the response to an RFI.

3.15 DEVELOPMENT OF ADVERSE WEATHER DATA

- A. Unless adverse weather data is defined elsewhere in the contract for construction, provide as follows;
- B. Collection of Adverse Weather Data
 - 1. Weather data obtained from the National Oceanic and Atmospheric Administration (NOAA) shall form the baseline for estimating anticipated delays and project durations and determining the occurrence of unusually severe weather. Data shall be collected and compiled as follows:
 - a. Contractor shall compile the number of days per month that the anticipated weather is expected to be adverse by analysis of NOAA. The last 5 years of consecutive data shall be used to establish the baseline of rain days per month associated with the project schedule duration. However, in the absence of 5 years of data, a shorter period may be used.
 - b. The compiled data shall be submitted with the Contractors Construction Schedule for documenting future weather events.

2. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents the Critical Path of construction activity exposed to weather conditions or access to the site:
 - a. Precipitation (rain, snow, or ice) in excess of one-quarter inch (0.25") liquid measure.
 - b. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
 - c. Sustained wind in excess of twenty-five (25) m.p.h.
 - d. Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that "dry-out" or "mud" days are not eligible to be counted as Weather Delay Day until the standard baseline is exceeded. Hence, Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable construction activities are expected to be prevented and suspended.
 3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and Critical Path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.
- C. Submission for Time Extension
1. Although the contractor is required to document the occurrence and effect of adverse weather on the work, it does not relieve the Contractor/Architect of its responsibility to investigate and determine if an excusable delay has occurred.
 2. The schedule of anticipated adverse weather delays included in the contract is established in work days. Similarly, actual weather data should be collected and recorded on a work day basis. Monthly summaries should be maintained indicating actual adverse weather conditions and the impact on work activities.
 3. To determine if any particular month experienced unusually severe weather, the number of actual adverse delay days is compared to that as provided by the NOAA database. If the number of actual delay days is greater than that in the contract the contractor has experienced unusually severe weather.
 4. THE DETERMINATION THAT UNUSUALLY SEVERE WEATHER OCCURRED DOES NOT AUTOMATICALLY MEAN THAT THE CONTRACTOR RECEIVES A TIME EXTENSION FOR THE DIFFERENCE OF DAYS BETWEEN THE ANTICIPATED AND ACTUAL ADVERSE WEATHER DELAY DAYS. Further analysis is necessary to determine if the unusually severe weather delayed work activities critical to contract completion. The contractor's progress schedule must be evaluated to make this determination. If it is found that unusually severe weather delayed the contract, a contract modification shall be issued pursuant to Gov. Code 2269
 5. Claims for increase in the contract time shall set forth in writing the detail noting the circumstances that form the basis for the claim, the date upon which each cause of delay began to affect the progress of the work, the date upon which each cause of delay ceased to affect the progress of the work and the number of days increase in the contract time claimed as a consequence of each such cause of delay. The Contractor shall bear the entire economic risk of all weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect in writing not later than the fifteenth (15th) day of the month following the month during which the delays or disruptions occurred, and shall include documentation demonstrating the nature and duration of the delays or disruptions. Where appropriate, a revised construction schedule indicating all the activities affected by the circumstances shall be included with the documentation.

END OF SECTION



MORE THAN ARCHITECTS

Electronic Document Release Form

Date: _____

Project: _____

_____ (Contractor) has requested access to a copy of the Building Information Model (BIM) and/or other electronic versions of the Construction Documents including, but not limited to survey, civil, structural, MEP drawings (the "Electronic Files") produced by Huckabee & Associates in conjunction with the above-mentioned project.

The Contractor acknowledges the following:

1. The BIM and Electronic Files remain the property and control of the Architect and its Subconsultants. Providing access to the BIM does not transfer copyright or ownership, and is a limited license to use in accordance with these and other conditions set by the Architect. The Contract Documents do not require the Contractor to use the BIM to prepare drawings in electronic format for use during construction, or the use in any way of BIM or CAD systems. The Contractor is not permitted to make alterations to the BIM, the Electronic Files, and/or the information contained therein.
2. The BIM, the Electronic Files, and the information contained are provided as is, in Revit Version 2017 format used by Huckabee & Associates. The BIM and Electronic Files are provided without warranty or guaranty of compatibility with the Contractor's software or hardware systems. Further, the Contractor acknowledges data stored within the BIM and the Electronic Files can be altered, either intentionally or unintentionally, by transcription, machine error, environmental factors, and duration of storage or operators.
3. The BIM, and the information contained therein is provided for the Contractor's convenience only, is not a Contract Document and does not relieve the Contractor from the requirements of the Contract Documents. The information provided in the BIM may not reflect the Contract Documents in all areas and the Contractor will be required to verify where changes have occurred. Also, field verification of existing and as-built conditions are required as part of the submittal process. See Specification Section 01 3000 Administrative Requirements and Section 01 7000 Execution and Closeout Requirements. A complete "hard copy" set of the documents represented by the BIM and related documents are also included. This hard copy set will be used as the precedent and authoritative document, and, in comparison with electronic files, shall supersede any discrepancies, omissions or errors shown on the electronic files.
4. The information provided in the BIM is only diagrammatic. Specifications require that the work and coordinated shop drawings reflect actual field-verified conditions with actual equipment/duct sizes, utility locations, and related site/project conditions.
5. The Contractor accepts responsibility for ensuring all persons, including subcontractors, using the BIM or Electronic Files comply with the requirements and limitations in using the information provided on them. Further, the use of this BIM and the Electronic Files is limited solely to this project. Use of BIM or the Electronic Files on other projects or on other applications by the Contractor is expressly prohibited.
6. This Hold Harmless Agreement shall be attached to and transmitted with the BIM at all times so that all those that the Contractor allows to have access are bound by the terms of this Agreement.

By accepting the BIM and/or the Electronic Files and the above stipulations, the Contractor and its agents, employees, subcontractors of any tier, material suppliers or any others that Contractor allows to access the BIM and/or Electronic Files agrees to defend, indemnify and hold harmless the Client and Huckabee & Associates, their agents, employees and all of their respective consultants (collectively, the "Indemnitees") and subconsultants from and against all claims, liabilities, damages, losses, expenses and costs (including expert and attorney's fees) ("Claims") arising from, relating to or resulting from the use of the BIM and/or Electronic Files **including those Claims arising from, relating to or resulting from the negligence or allegations of negligence of any one or more of Indemnitees, unless there is a determination by the trier of fact that Huckabee & Associates' sole negligence or willful misconduct caused the Claims.**

Accepted:

Signature of Authorized Agent of Contractor

Print Name of Authorized Agent of Contractor

DATE

Huckabee

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www.huckabee-inc.com

AGREEMENT BETWEEN CONTRACTOR AND ARCHITECT CONCERNING USE OF ELECTRONIC MEDIA

This Agreement and release is hereby entered into by and between (Contractor Name) _____ referred to collectively as "CONTRACTORS"; and "HUCKABEE & ASSOCIATES, INC. hereinafter referred to collectively as "ARCHITECTS/ENGINEERS".

WITNESSETH:

WHEREAS, "ARCHITECT/ENGINEERS" have and are providing professional services on a project known generally as (Project Name and Number) _____ - hereinafter referred to as the "PROJECT"; and

WHEREAS, "ARCHITECT/ENGINEERS" have prepared as a part of their service, various documents, drawings and other data, some of which is stored in various electronic media; and

WHEREAS, "CONTRACTORS" are providing work, labor and materials for the construction of the "PROJECT" and as a part of their performance are required to prepare and to submit various shop drawings and other submittals pursuant to the terms and provisions of the contract documents; and

WHEREAS, "CONTRACTORS" have requested access to various documents and drawings and other information, some of which is stored in various electronic media for their use in simplifying the preparation of shop drawings and other submittals; and

WHEREAS, "ARCHITECTS/ENGINEERS", under no compulsion to do so and purely as a convenience to "CONTRACTORS" have consented to limited use under the following terms and conditions, it is accordingly;

AGREED BY AND BETWEEN THE PARTIES AS FOLLOWS:

1. "CONTRACTORS" shall provide "ARCHITECTS/ENGINEERS" with a written request for any documents or other items sought to be used.
2. "ARCHITECTS/ENGINEERS" shall respond, in writing, to "CONTRACTORS" within seven days of receipt of such written request stating whether or not the documentation or other items will be provided with such determination to be solely within the discretion of "ARCHITECTS/ENGINEERS".
3. "CONTRACTORS" shall pay all reasonable out of pocket expenses of "ARCHITECTS/ENGINEERS" in providing such documents or other items to "CONTRACTORS".
4. In accepting and utilizing any drawings or other documents, including any data on any form of electronic media generated and provided by "ARCHITECTS/ENGINEERS", "CONTRACTORS" agree that all such drawings, documents and data are instruments of service of the "ARCHITECTS/ENGINEERS", who shall be deemed the author of the drawings, documents and other data, and shall retain all common law, statutory law and other rights, including copyrights.
5. "CONTRACTORS" agree not to use such drawings, documents or other data, in whole or in part, for any purpose or project other than the "PROJECT" in the preparation of shop drawings and other submittals.
6. "CONTRACTORS" acknowledge that such drawings, documents and other data are in an evolutionary process and are subject to change or modification and "CONTRACTORS" agree to bear full responsibility to update any drawings, documents or other data obtained pursuant to this agreement prior to use by them for any purpose.
7. **Such drawings, documents or other data are provided, if at all, "AS IS" without representation or warranty by "ARCHITECTS/ENGINEERS", either express or implied, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE SPECIFICALLY EXCLUDED.**
8. "CONTRACTORS" acknowledge that such drawings, documents and other data, if any, are being provided by "ARCHITECTS/ENGINEERS" as a courtesy to "CONTRACTORS", at their specific request, and accordingly **"CONTRACTORS" do hereby release and discharge "ARCHITECTS/ENGINEERS" and the (Owner Name) _____ hereinafter referred to as "OWNER", from any and all claims, demands, actions or causes of action, both actual and exemplary, both as to person and to properly, whether at common law or under the statutes of the State of Texas or any other jurisdiction including the Federal Government, which "CONTRACTORS" may have or could claim to have by reason of any injury or damage sustained by "CONTRACTORS" growing out of the use of such drawings, documents or other data, WHETHER OR NOT CAUSED IN WHOLE OR IN PART BY ANY NEGLIGENT ACT, OMISSION OR OTHER FAULT OF "ARCHITECTS/ENGINEERS" AND/OR THE "OWNER."**
9. **"CONTRACTORS" further agree to indemnify, defend and hold harmless "ARCHITECTS/ENGINEERS" and "OWNER" from any damage, liability or cost, including reasonable attorney's fees and cost of defense, growing out of "CONTRACTORS" use of such drawings, documents or other data, WHETHER OR NOT CAUSED IN WHOLE OR IN PART BY ANY NEGLIGENT ACT, OMISSION OR OTHER FAULT OF "ARCHITECTS/ENGINEERS" AND/OR "OWNER."(date) _____**

IT IS THE EXPRESS INTENTION OF THE PARTIES HERETO AND EACH PARTY BY ITS SIGNATURE TO THIS AGREEMENT SPECIFICALLY ACKNOWLEDGES THAT IT IS THE PURPOSE OF THIS AGREEMENT TO PROTECT "ARCHITECTS/ENGINEERS" AND THE "OWNER." EVEN FROM THEIR OWN NEGLIGENCE OR OTHER FAULT, IN WHOLE OR IN PART AS REQUIRED BY THE EXPRESS NEGLIGENCE RULE ADOPTED BY THE TEXAS SUPREME COURT AND THE PARTIES AGREE THAT PARAGRAPHS 7, 8, AND 9 ARE CONSPICUOUS AS REQUIRED UNDER RULINGS OF THE TEXAS SUPREME COURT.

ARCHITECT:
HUCKABEE & ASSOCIATES, INC.
801 CHERRY STREET, SUITE 500
FORT WORTH, TEXAS 76102
817-377-2969

CONTRACTOR:
Name:
Address:
City, State Zip:
Phone:

Signed

Signed

Printed Name

Printed Name

Date:

Date:

Consultant(s):



MORE THAN ARCHITECTS

Request for Technology / Security Construction Documents

Owner:

Project Name:

Project Number:

1. **Retaining and Destroying Documents.** All documents must be safeguarded against unauthorized use for the term of retention. All documents used in the course of bidding on the project will be returned to Huckabee and Associates. All documents used during the course of the project will be destroyed by burning or shredding hard copies, deleting CDs, and removing electronic files permanently from computer hard drives.
2. **Unauthorized reproduction.** The contractor will not make any unauthorized copies of the technology specifications or the drawings without the express written consent of the owner and architect.
3. **Written agreement of disposal.** The Subcontractor shall provide a written statement that he and all of his subcontractors have properly disposed of all copies of the information provided to and copied by anyone connected to said subcontractor, prior to receiving final payment.

The recipient acknowledges the requirement to use REASONABLE CARE, as outlined above, to safeguard the documents. If not awarded, the contractor will return the complete set of documents to the architect. If awarded the contract, the contractor may return or destroy all physical and electronic documents when no longer required to perform the work.

I agree that I will abide by this agreement and will only disseminate "sensitive" but "unclassified" building information to other authorized users under conditions set forth above.

GENERAL CONTRACTOR:

TECHNOLOGY SUBCONTRACTOR

Contractor Name:

Contact Name:

Address:

City, State, Zip:

Signed

Signed

Printed Name

Printed Name

Date:

Date:

Huckabee

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CONTINUATION SHEET

AIA DOCUMENT G703

PAGE OF PAGES

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECTS PROJECT NO:

PROJECT NAME:

A	B	C	D		E	F	G		H		I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED			MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)	
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD							
Division 01 — General Requirements											
	General Conditions & Staff	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	#DIV/0!	\$0.00	\$0.00	
1	Payment & Performance Bonds						\$0.00	#DIV/0!	\$0.00	\$0.00	
2	Etc.						\$0.00	#DIV/0!	\$0.00	\$0.00	
Building 1											
Division 2 - Existing Conditions											
	02 4100-Demolition - Labor						\$0.00	#DIV/0!	\$0.00	\$0.00	
11	02 4100-Demolition - Material						\$0.00	#DIV/0!	\$0.00	\$0.00	
12	Etc.						\$0.00	#DIV/0!	\$0.00	\$0.00	
Division 3 - Concrete											
	03 1000-Concrete Forming and Accessories - Labor						\$0.00	#DIV/0!	\$0.00	\$0.00	
21	03 1000-Concrete Forming and Accessories - Material						\$0.00	#DIV/0!	\$0.00	\$0.00	
22	Etc.						\$0.00	#DIV/0!	\$0.00	\$0.00	
Include all associated divisions, continue sequentially											
Contingency Expenditures											
61	PR#001 City Comments - Allowance						\$0.00	#DIV/0!	\$0.00	\$0.00	
62	PR#002 Storm Water Relocate - Contingency						\$0.00	#DIV/0!	\$0.00	\$0.00	
Building 2											
Division 2 - Existing Conditions											
88	02 4100-Demolition						\$0.00	#DIV/0!	\$0.00	\$0.00	
	Complete additional lines per scope						\$0.00	#DIV/0!	\$0.00	\$0.00	
Contingency Expenditures											
167	PR#021 Additional Marker Boards - Allowance						\$0.00	#DIV/0!	\$0.00	\$0.00	
							\$0.00	\$0.00	\$0.00		
	GRAND TOTALS	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	#DIV/0!	\$0.00	\$0.00	

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 1000 - Summary of Work.

1.03 REFERENCE STANDARDS

- A. AGC (CPSM) - Construction Planning and Scheduling Manual 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM 2015.

1.04 SUBMITTALS

- A. Within 14 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations.
- B. If preliminary schedule requires revision after review, submit revised schedule within 7 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements
- H. Approval by the Owner and Owner's Representatives of the Contractor's Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Construction Schedule shall not excuse performance, which is not in compliance with the Contract. Approval by the Owner and Owner's Representatives in no way makes the Owner or Owner's Representatives an insurer of the Construction Schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner or Owner's Representatives approval of or acquiescence to the Construction Schedule.
- I. It is to be expressly understood and agreed by the Contractor that the schedule is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the early or late start dates or complete work activities on the early finish or late finish date shown in the schedule, or as same may be updated or revised; nor does the Owner or Owner's Representative guarantee that Contractor can proceed at all times in the sequence established by said schedule. If Contractor's schedule indicates that Owner or a separate contractor is to perform an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees, in writing, to same; the Owner's and / or the Owner's Representative's overall review and approval or acceptance of the schedule does not constitute an agreement to specific dates, duration or sequences for activities of the Owner or any separate contractor.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with three years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

- B. Contractor's Administrative Personnel: three years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Width required.
- C. Sheet Size: Multiples of 8-1/2 x 11 inches.
- D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Critical Path Method (CPM) to show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of phases, separate stages or proposed occupancies and other logically grouped activities.
- D. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary.
- E. Include contract milestone dates and completion dates as specified in the contract.
- F. Provide sub-schedules to define critical portions of the entire schedule.
- G. Include conferences and meetings in schedule.
- H. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- I. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- J. Indicate delivery dates for owner-furnished products and Owner furniture or equipment scheduled for salvage and/or relocation in project.
- K. Indicate testing of materials.
- L. Indicate activity periods for punch list.
- M. Indicate the work to be performed during the facility's scheduled holidays, weekends, or summer recess periods.
- N. Coordinate content with schedule of values specified in Section 01 3000.
- O. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.
- C. The schedule diagram shall be a time-scaled drawing.
- D. The Construction Schedule Detailed Reports, initial submittal and subsequent updates or revisions, shall indicate each of the following:
 - 1. Description of activity including activity number/numbers.
 - 2. Estimated duration time or remaining duration for each activity.
 - 3. Early start date for each activity.
 - 4. Late start date for each activity.
 - 5. Early finish date for each activity.
 - 6. Late finish date for each activity.
 - 7. Float available for each path of activities containing float.
 - 8. Actual start date for each activity begun.
 - 9. Actual finish date for each activity completed.

10. Identification of all critical path activities in the mathematical analysis.
11. The critical path for the Project, with said path of activities being clearly and easily recognizable on the time-scaled graphic diagram, and the relationship between all non-critical activities and activities on the critical path shall be clearly shown on the graphic diagram.
12. The dollar value of each activity in relation to the schedule of values. This may be shown on a separate cost report.
13. The responsibility code for the Contractor or Subcontractor performing each activity or portion thereof.
14. The percentage complete of each activity in progress or complete.

3.04 SCHEDULE OF OFF-SITE ACTIVITIES

- A. The Contractor shall include in his Construction Schedule all procurement related activities which lead to the delivery of materials to the site in a timely manner. Upon written approval by the Project Manager, these activities may be submitted as a separate Off-Site Activities Schedule, properly correlated to the Construction Schedule. The schedule of off-site activities shall include, but is not limited to, the following:
 1. Dates for submittals, ordering, manufacturing or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to site shall be clearly noted;
 2. All significant activities to be performed by the Contractor during the fabrication and erection/installation in a Contractor's plant or on a job site, including materials/equipment purchasing, delivery; and
 3. Contractor's drawings and submittals to be prepared and submitted to the architect.
- B. The Contractor shall be solely responsible for expediting the delivery of all material to be furnished by him so that the construction progress shall be maintained according to the current schedule for the Work.
- C. The Owner's Representatives shall be advised, in writing, by the Contractor whenever it is anticipated by the Contractor that the delivery date of any material and/or equipment furnished by the Contractor for installation will be later than the delivery date shown on the schedule, subject to schedule updates.
- D. Submittals, equipment orders and similar items are to be treated as schedule activities, and shall be given appropriate activity numbers.

3.05 FLOAT TIME

- A. Float or slack time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of an activity or a chain of activities on the Construction Schedule. Float or slack time is not for the exclusive use or benefit of either the Contractor or the Owner. Contractor's work shall proceed according to early start dates, and the Owner's Representatives shall have the right to reserve and apportion float time according to the needs of the Project. The Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon Contract completion times, providing that the actual delay does not exceed the float time associated with those activities.
- B. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustment for the activity or activities affected by any condition or event which entitles the Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Document.

3.06 SCHEDULE UPDATES AND REPORTS

- A. Every month, in conjunction with the monthly application for payment, the Contractor shall submit an updated graphic diagram and an updated detailed schedule report from the Construction Schedule and updated Record Documents. Contractors Application for Payment shall not be approved for payment unless schedule is attached and Record Documents are current. The schedule shall be updated to show actual progress and the effect of delays and other events. The actual start and finish dates shall be included in the detailed report, as well as the actual dates of the Milestone events.
- B. The content of the updated Construction Schedule shall be equal to that noted in Section 1.02 Construction Schedule.
- C. The updated Construction Schedule submitted by Contractor shall not show a completion date later than the Contract Completion Date, subject to any time extensions approved by Owner.

3.07 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 7 days.

3.08 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Update diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.09 RECOVERY SCHEDULE

- A. Should the Contractor's Construction Schedule indicate that the progress of the work is behind schedule to the extent that any of the mandatory specific or milestone dates or completion dates are in jeopardy the Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner's Representatives within 72 hours, a Recovery Plan, in a form and detail appropriate to the need and explain and display how he intends to reschedule those activities to regain compliance with the Construction Schedule.

3.10 SCHEDULE REVISIONS

- A. Should the Contractor, after approval of the initial Construction Schedule, desire to change his plan in construction, he shall submit his required revisions to the Owner's Representatives along with a written statement of the revisions including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate Milestones and Specific Dates and the reasons for the revisions. The Contractor shall revise his schedule to include the effect of changes, acts of God, and other conditions or events, which have affected the Schedule. If the requested changes are acceptable to the Owner and Owner's Representatives, the changes will be incorporated into the Construction Schedule in the next reporting period.
- B. When the Owner orders changes by change Order which have the potential to impact the Contract Milestones or Specific Dates stipulated in the Supplemental Conditions, a Schedule will be prepared by the Contractor and provided to the Owner's Representatives for concurrence or revision. After the proposed schedule revision has been mutually agreed upon, it will be incorporated into the Construction Schedule. Change Order logic will affect only those activities and performance data directly concerned. Adjustments in Scheduled intermediate

Completion Dates or for the Contract as a whole will be considered only to the extent that there is insufficient remaining float to absorb these changes.

- C. Any change to the approved Construction Schedule must be approved, in writing, by the Owner and Contractor.
- D. Neither the updating or revision of Contractor's Construction Schedule nor the submission, updating, change or revision of any report or schedule submitted to Owner's Representatives by Contractor under this Section nor Owner's review or non-objection of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way Contractor's obligations under this Contract.

3.11 REQUESTED TIME ADJUSTMENT SCHEDULE

- A. The updated Construction Schedule submitted by Contractor shall not show a completion date later than the Contract Time, subject to any time extensions approved by Owner:
 - 1. Provided, however, that if Contractor believes he is entitled to an extension of the Contract Time under the Contract Documents, Contractor shall submit to Owner's Representatives, with each progress payment update, a separate schedule analysis (entitled "Requested Time Adjustment Schedule") indicating suggested adjustments in the Contract Time which should, in the opinion of Contractor, be made in accordance with the Contract Documents by time extension, due to changes, delays or conditions occurring during the past month or previously, or which are expected or contemplated by Contractor (whether such conditions are excusable under the Contract or are alleged to be due to Contractor or Owner fault); this separate schedule, if submitted, shall be time-scaled utilizing a computer generated and computer-drawn Schedule analysis schedule, unless otherwise approved by the Owner's Representative and shall be accompanied or preceded by a formal time extension request as required by the Contract and a detailed narrative justifying the time extension requested.
- B. The time extension request shall include schedule forecasts that predict the actual Project Completion Date, and any separable portions thereof specified by Owner plus a forecast of the actual achievement of any milestones listed in the Owner-Contractor Agreement.
- C. To the extent any time extension requests are ending at the time of any update in the Construction Schedule, the "Requested Time Adjustment Schedule" shall also be updated each month, to reflect any adjustments made by Contractor in the logic, sequence or duration of any activities in the Construction Schedule, or any time extensions previously granted by Owner, and to reflect actual or expected progress, in order that the "Requested Time Adjustment Schedule" shall clearly and accurately reflect Contractor's Actual intention and proposed time adjustments as of the latest update.
- D. Neither the Owner, the Project Manager or the Architect shall have any obligation to consider any time extension request unless the requirements of the Contract Documents, and specifically, but not limited to these requirements, are complied with; and Owner shall not be responsible or liable to Contractor for any constructive acceleration due to failure of Owner to grant time extensions under the Contract Documents should Contractor fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requested. Contractor's failure to perform in accordance with the Construction Schedule shall not be excused, nor be chargeable to Owner, because Contractor has submitted time extension requests or the "Requested Time Adjustment Schedule".

3.12 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Tolerances.

1.02 RELATED REQUIREMENTS

- A. Document 00 3132 - Geotechnical Data
- B. Section 01 4516 - Contractor Quality Control. Testing and Inspection services.
- C. Section 01 4533 - Code-Required Quality Control.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in specification Section 01 4516 - Contractor's Quality Control and Section 01 4533 - Code-Required Quality Control.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect and Owner, it is not practical to remove and replace the Work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

**SECTION 01 4100
REGULATORY REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes, but is not limited to:
 - 1. Permits and fees.
 - 2. Code and regulatory compliance for the associated Work.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements.

1.03 PERMITS AND FEES

- A. The Owner will pay for all City and/or State Building Permits, Impact Fees, and other Building Fees related to the project. The Contractor and Subcontractors will be responsible for obtaining all required trade permits or license fees.
- B. Once General Contractor is in possession of the final construction permits (building permits), Contractor shall be responsible for submitting to the AHJ, approved request for pricing (RFP), change orders, or other documents that contain significant changes to the contract until construction is complete. Contractor shall pay for permits or fees associated with any required changes.

1.04 BUILDING CODES

- A. Building Code Compliance: Reference drawings for year editions used in document design.
 - 1. Building Code – International Building Code
 - 2. Plumbing Code – International Plumbing Code
 - 3. Mechanical Code – International Mechanical Code
 - 4. Electrical Code – National Electrical Code
 - 5. Life Safety Code – NFPA 101
- B. Energy Code Compliance
 - 1. Energy Code – International Energy Code.
 - 2. Contractor shall provide, at the jobsite office, one copy of the completed energy code review.
- C. Accessibility Compliance
 - 1. Accessibility requirements are from the 2010 ADA Standards for Accessible Design, and the 2012 Texas Accessibility Standards of the Architectural Barriers Act.
 - 2. The information contained in this section is provided to identify the modifications provided for users who are not served by adult standards. It shall be the Contractors responsibility to be familiar with the standards and to apply the standards to all aspects of the project. Any apparent conflict between current standards and the drawings shall be brought to the architect's attention for clarification. The information in the drawings does not release the contractor from full compliance with the latest TAS requirements.
 - 3. Contractor shall provide, at the jobsite office, one copy of the 2012 Texas Accessibility Standard (TAS) regulations as prepared by the Texas Department of Licensing and Regulation, concerning handicap accessibility. The Contractor shall conform to the regulations as set forth in the TAS. Copies can be obtained at Texas Department of Licensing and Regulation, P.O. Box 12157, Austin, TX; 512-539-5669 / Fax 512-539-5690; www.license.state.tx.us. Copies may be downloaded from <http://www.license.state.tx.us/ab/abtas.htm>.
 - 4. Federal Register:
 - a. Vol. 56, No. 144, July 26, 1991, Rules and Regulations; Appendix A to part 36 – Standards for Accessible Design.

- b. 5 U.S.C. 552(a) and 1 C.F.R. part 51, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Building Elements Designed for Children's Use.
- 5. Texas Accessibility Standards
 - a. The Elimination of Architectural Barriers Texas Government Code, Chapter 469, effective March 15, 2012.

1.05 ACCESSIBILITY REQUIREMENTS

A. General

- 1. All general TAS standards apply and staff-use areas and spaces for the use of students above the age of 12 shall be designed for adult users. In facilities for younger students, adult-use spaces will commonly be identified by their name (MEN, WOMEN, STAFF TLT, etc). Juvenile-use spaces will be likewise identified (BOYS, GIRLS, STU TLT, etc.).
- 2. Besides the transition to adult dimensions for students above the age of 12, some requirements vary additionally, depending on age. Refer to the tables enclosed for the varying heights and spacing required.
- 3. Age/Grade ranges are interpreted as follows:
 - a. Ages 3 years and 4 years / Pre-Kindergarten
 - b. Ages 5 years thru 8 years / Kindergarten thru 3rd Grade
 - c. Ages 9 years thru 12 years / 4th Grade thru 7th Grade
 - d. Over 12 years / 8th Grade thru Adult

B. Dimensional Tolerances

- 1. Contractor is reminded that while the TAS guidelines allow for "construction and manufacturing tolerances" there is no "definition" of what that tolerance is, therefore, where TAS gives a single absolute dimension, every effort should be made to equal that dimension. Where TAS provides a dimensional range, or a minimum or a maximum, there is NO construction tolerance. Any dimension less than the minimum or more than the maximum will be rejected upon inspection and subject to correction.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Texas.
 - 1. The General Contractor or Construction Manager shall comply with the Texas Professional Services Procurement Act when selecting an Engineer for Delegated Design Services.

PART 2 PRODUCTS

2.01 GENERAL

- A. Contractor shall note that no regulatory agency designates products with a formal "ADA Approved" designation. Contractor shall be responsible for ensuring all products are reviewed for accessibility compliance.

PART 3 EXECUTION

3.01 REPAIR

- A. Non-Compliant Work
 - 1. The Contractor shall be responsible for removing and correcting all work that is found to be in non-compliance.
 - 2. The Contractor shall perform all work at no expense to the Owner.
 - 3. The Contractor shall be responsible to perform all repairs regardless of the date at which the non-compliant items are found.
- B. The work shall be performed such that there will be no disruption to the Owner schedule.

END OF SECTION

SECTION 01 4516
CONTRACTOR'S QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Testing and inspection services by one or more quality assurance laboratories to be employed by the Contractor (if these services are not provided by subcontractors or material suppliers).
The purpose of quality assurance services are so that the Contractor can verify work is done properly during construction, before the Contractor requests that the Owner's Independent Quality Control Agency performs code-required special inspections, tests and structural observations. The Contractor's QA Laboratory testing and inspection services shall include, but not be limited to:
 - 1. Testing, inspection, and certifications specified in sections of Project Manual other than Section 01 4533. This quality assurance testing shall be paid by the Contractor.
 - 2. Earthwork borrow pit material verification
 - 3. Concrete mix design verification
 - 4. Masonry unit compressive strength verification
 - 5. HVAC Testing and Balancing
 - 6. Certification of No Asbestos Containing Materials
- C. References and standards.
- D. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Document 00 3132 - Geotechnical Data
- B. Section 01 3000 - Administrative Requirements: Submittal procedures.
- C. Section 01 4000 - Quality Requirements
- D. Section 01 4533 - Code Required Quality Control
- E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 QUALITY ASSURANCE (OF CONTRACTOR'S QUALITY ASSURANCE LABORATORY)

- A. Contractor's QA Laboratory Qualifications and Procedures:
 - 1. Meet "Recommended Requirements for Independent Laboratory Qualification," latest edition published by American Council of Independent Laboratories. Testing agencies shall meet the requirements of ASTM E 329, "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM E 543, "Determining the Qualification of Nondestructive Testing Agencies."
 - 2. The inspection and testing services of the testing agency shall be under the direction of a Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having at least five years engineering experience in inspection and

testing of construction materials.

3. Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
4. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection. Include memorandum of remedies of deficiencies reported by this inspection.
5. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
6. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of the American Society for Testing and Materials and other recognized authorities as approved.
7. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, "Standard and Guide for Qualification and Certification of Welding Inspectors." The inspector may be supported by assistant inspectors who may perform specific inspection functions under the supervision of the inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). The work of assistant inspectors shall be regularly monitored by the inspector, generally on a daily basis.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. See Section 01 4000 - Quality Requirements

3.02 GENERAL REQUIREMENTS FOR CONTRACTOR'S LABORATORY SERVICES

- A. The Contractor shall perform various tests as required in the various specification sections for conformance to the construction documents other than those in Section 01 4533. The Owner maintains the right to verify the test results with an independent testing lab.
- B. Contractor's design testing and certification testing includes:
 1. Testing defined in this Specification Section.
 2. Testing when source of material is changed after initial tests have been performed.
 3. Other testing required by other Sections of the Specifications.

3.03 EARTHWORK

- A. Earthwork: Identify suitable material at borrow material location, sampling soil material, and testing of soil material samples.

3.04 DRILLED PIERS

- A. The Contractor shall provide all equipment, materials and labor required for the Test Pier Holes specified in Section 31 6329.

3.05 CONCRETE

- A. Furnish concrete mix designs, in accordance with ACI 301, Section 3.9, made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, the laboratory shall be selected by the Contractor, approved by the Architect, and paid by the Contractor.

3.06 MASONRY

- A. Furnish laboratory testing from the manufacturer or a Contractor-hired laboratory that verifies the compressive strengths of masonry units comply with specifications.
- B. Absorption Tests:
 - 1. Perform a field of test for water absorption on three representative clay units and at least once for each 5,000 square feet of wall before laying.
 - 2. The field test shall consist of drawing a one inch diameter circle with a wax pencil (the diameter of a quarter). Place thirty (30) drops of water from a medicine dropper in rapid succession with the circle. If all of the water is absorbed into the brick in less than 60 seconds, the units shall be deemed "to dry" and shall be prewetted.

3.07 HVAC TESTING AND BALANCING

- A. The Contractor shall provide complete testing and balancing services for all HVAC and control systems to be carried out by an independent certified testing and balancing (TAB) agency under a separate and direct contract with the General Contractor. Scope of testing and balancing services, Contractor obligations, etc. shall be in accordance with Testing, Balancing and Commissioning specification section.

3.08 CERTIFICATION OF NO ASBESTOS CONTAINING MATERIAL

- A. The Contractor shall provide the Architect a written certification of the following;
 - 1. Hazardous material-free construction – certify that no asbestos containing material was used and/or incorporated into the project during construction.
 - 2. The statement shall be as follows:
 - a. The undersigned, pursuant to the General and Supplementary Conditions of the Contract for Construction, hereby certifies that to the best of his/her knowledge, information and belief, the materials incorporated into the project and as used during the construction process are free of any type of asbestos material, lead, polychlorinated biphenyl (PCB) or other materials identified by governmental agencies as being hazardous.

3.09 MANUFACTURERS' FIELD SERVICES

- A. See Section 01 4000 - Quality Requirements

3.10 DEFECT ASSESSMENT:

- A. See Section 01 4000 - Quality Requirements

END OF SECTION

SECTION 01 4533
CODE-REQUIRED QUALITY CONTROL

PART 1 GENERAL

1.01 IMPORTANT NOTE FOR ALL PLAN REVIEWERS (AHJ) TO READ BEFORE ISSUING A BUILDING PERMIT!

- A. This Section (Specification Section 01 4533) is the "Statement of Special Inspections, Testing, Structural Observations and Commissioning" for this project and is hereby submitted to the building official for review and approval. This statement has been prepared collaboratively by the Architect and appropriate Design Professionals such that the registered design professional responsible for the design of each portion of the work considered the requirements of Chapter 17 of the International Building Code (IBC), considered the Commissioning requirements of the International Energy Conservation Code, considered the nature of the work, and then customized this statement specifically for this project based on their professional opinion of what they recommend for the code-required quality control plan. In some instances, the special inspections, testing and/or structural observation required by this statement are significantly less than the special inspections, testing and/or structural observations that would be required by the IBC without Exception #1 in IBC Section 1704.2 which states special inspections, tests, and/or structural observations are not required for construction as warranted by conditions in the jurisdiction as approved by the building official. This customized quality control plan also includes some variations from procedures required by IBC Chapter 17, such as submitting certain items to Registered Design Professionals in lieu of the AHJ; these variations are based on procedures that AHJ's have indicated are preferred and also the experience of the Registered Design Professionals which indicates that this quality control plan (including these procedural variations) will meet or exceed the local standard of care. It is our understanding that the AHJ has the authority to allow these procedural variations on code-required quality control because the AHJ has the authority to waive the entire quality control plan under Exception #1 in IBC Section 1704.2. According to IBC Section 105.3.1, "If the application or the construction documents do not conform to the requirements of pertinent laws, the building official shall reject such application in writing, stating the reasons therefor. If the building official is satisfied that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, the building official shall issue a permit therefor as soon as practicable." Therefore, if a building permit is issued without written notification that this statement or a portion thereof is rejected, it will be understood that this Statement of Special Inspections, Testing, Structural Observations and Commissioning is acceptable in the opinion of the building official, who has the authority to render interpretations of the code according to IBC Section 104. For clarification, this Statement includes the information required by IBC Section 1704.5 to be submitted to the AHJ before commencement of structural observations.
- B. Chapter 17 of the International Building Code requires that the AHJ approve Special Inspection and Testing Agency (SITA) staff qualifications and requires that discrepancies identified during construction be resolved in order to comply with the building code. Based on Huckabee's experience with numerous AHJ's, it is understood that, instead of the AHJ directly reviewing these qualifications and resolutions, it is acceptable to the AHJ for Registered Design Professionals to determine whether or not SITA staff qualifications are acceptable and determine what resolutions to discrepancies identified during construction comply with the building code, without soliciting the opinion of the AHJ. And, for clarification, some discrepancies that occur during construction often include scenarios in which the specified scope for a quality control agency was not performed due to the Owner not hiring an agency to do some portion of the scope, inaction by the Contractor, inaction by the hired quality control agency or a miscommunication between parties. Therefore, it shall be considered acceptable for the Registered Design Professionals for each respective design discipline to be considered

the sole determinant of acceptable quality control agency qualifications and resolutions of discrepancies and not report these details to the AHJ, if a building permit is issued without written notification that this understanding is incorrect.

1.02 OWNER-PREPARED DOCUMENTS

- A. Sections 01 1400 and 01 4533 require that the Owner participate in the preparation of certain documents (e.g. Owner Agreement with the SITA) before critical construction schedule milestones. Proposers shall assume for proposal purposes that the Owner will provide these documents or provide all necessary participation of these documents without causing a delay to the construction schedule. However, the Contractor shall notify the Owner in writing 45 days before such a document is necessary to avoid a delay, notifying the Owner in writing of the deadline necessary to avoid a delay.

1.03 REQUIREMENTS FOR QUALITY CONTROL

- A. Requirements for Quality Control:
 - 1. Special inspections and testing services shall be provided by an agency to be selected and employed by the Owner, which is referred to herein as the Special Inspection and Testing Agency (SITA). The SITA may subcontract other firms to provide quality control services on behalf of the SITA as necessary; however, the SITA shall be responsible for providing directly or indirectly all of the SITA responsibilities defined in Section 01 4533.
 - 2. Commissioning services shall be performed by the Commissioning Agent (CxA) as specified in Division 01 and Divisions 22-26.
 - 3. As a general part of the Code-Required quality control plan, Design Professionals shall be notified at appropriate times and allowed to make site visits and visual observations for general conformance with the contract documents.
 - 4. It shall not be required to notify and obtain approval from the AHJ if alternative arrangements are made in hiring firm(s) to provide quality assurance services (e.g. Owner hiring multiple firms, Architect acting as the Owner's Agent and hiring the SITA, Owner hiring the Structural Observer, etc...)
 - 5. Each type of quality control service shall be considered separate from every other type of quality control service. The services by one quality control firm do not relieve the responsibility of the other quality control firm to provide their quality control services.

1.04 RELATED REQUIREMENTS

- A. Document 00 3132 - Geotechnical Data
- B. Section 01 1400 - Work Restrictions: Work restrictions related to quality assurance.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures.
- D. Section 01 4000 - Quality Requirements.

1.05 DEFINITIONS

- A. Authority Having Jurisdiction (AHJ): The agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located. Where the term "building official" is used, it shall refer to the AHJ
- B. Code or Building Code: 2015 Edition of the International Building Code and documents referenced by that document.
- C. Commissioning Agent (CxA): The agent specified to perform the Commissioning specified in Division 01 and Divisions 22-26.
- D. Design Professionals: For the purposes of Section 01 4533, the term "Design Professionals" shall refer to every Design Professional responsible for the design, or making recommendations regarding the design, of any portion of the project, including but not limited to the Geotechnical Engineer, professionals that sealed drawings on the Contract Documents, as well as any professionals hired by the Contractor. (Examples on some projects may be the Geotechnical Engineer, Architect, Civil Engineer, Structural Engineer, Mechanical Engineer, Electrical Engineer, Contractor's Cold Formed Metal Framing Engineer, Contractor's Pre-Manufactured

Canopy Engineer, Contractor's Pre-Engineered Metal Building Engineer, Contractor's Precast Concrete Engineer, etc...)

- E. Special Inspection and Testing Agency (SITA): The agencies responsible for providing all required special inspections and testing defined by Section 01 4533.
 - 1. Where used in the contract documents, the following terms (if used) shall also refer to the Special Inspection and Testing Agency (SITA):
 - a. "Special Inspection Agency"
 - b. "Construction Materials Engineering Firm"
 - c. "Construction Materials Testing Firm"
 - d. "Owner's Testing Laboratory"
 - e. "Independent Testing Laboratory"
- F. Special Inspections and Tests: The Special Inspections and Tests for this project are the inspections and tests required by Section 01 4533. These special inspections and tests are independent of any inspections and tests conducted directly by Midlothian ISD or Contractor.
- G. Quality control observations: For the purposes of Section 01 4533, the term "quality control observations" shall refer to the observations by the following quality control personnel:
 - 1. CxA
 - 2. Design Professionals
- H. Quality control observers: For the purposes of Section 01 4533, the term "quality control observers" shall refer to the personnel acting on behalf of the firms providing quality control observations.
- I. Quality control personnel: For the purposes of Section 01 4533, the term "quality control personnel" shall refer to the personnel acting on behalf of the following as they perform quality control services associated with Section 01 4533:
 - 1. SITA
 - 2. CxA
 - 3. Design Professionals
- J. Quality control services: For the purposes of Section 01 4533, the term "quality control services" shall refer to the services required by Section 01 4533 to be performed by the quality control personnel.

1.06 **REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary ; 2011.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement ; 2015.
- C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field ; 2012.
- D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete ; 2010.
- E. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel ; 2008.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel ; 2011.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories ; 2010.
- H. IAS AC291 - Accreditation Criteria for Special Inspection Agencies ; 2012.
- I. AASHTO R18 - Accreditation for Materials Testing Laboratories

1.07 **APPROVAL OF SITA QUALIFICATIONS AND SCOPE**

- A. SITA Qualifications: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement for approval by the Architect indicating that the SITA firm and SITA Staff that will be assigned to this project will meet the following qualifications. The SITA shall indicate the years of experience performing similar work if a listed certification is not held by any proposed personnel (e.g. "We will only assign staff to this project that meets the listed certifications in Section 01 4533 with the exception that our masonry inspection and testing personnel have at least 10 years of experience performing masonry inspection and testing on

similar projects but do not have a TMS Certification”):

1. It shall be required that the Special Inspections and Testing Agency (SITA) be accredited by IAS according to IAS AC291 and IAS AC89, or be accredited by AASHTO (or AMRL) unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Architect.
2. It shall be required that the Construction Materials Engineer be a Professional Engineer with Construction Materials Engineering experience that is licensed in the State of Texas.
3. It shall be required that the Concrete Inspection Technicians be at least certified ACI (American Concrete Institute) Concrete Field Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete inspection services on similar projects by the Structural Engineer.
4. It shall be required that the Concrete Testing Technicians be at least certified ACI (American Concrete Institute) Concrete Laboratory Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete testing services on similar projects by the Structural Engineer.
5. It shall be required that the Masonry Inspection Technicians be at least certified TMS (The Masonry Society) or ACI (American Concrete Institute) Masonry Field Testing Technicians unless the SITA obtains written approval of the technician's experience performing masonry inspection services on similar projects by the Structural Engineer.
6. It shall be required that the Masonry Testing Technicians be at least certified TMS (The Masonry Society) or ACI (American Concrete Institute) Masonry Laboratory Testing Technicians unless the SITA obtains written approval of the technician's experience performing masonry testing services on similar projects by the Structural Engineer.
7. It shall be required that the Steel Inspection and Testing Technicians (for both Structural Steel Framing as well as Cold Formed Metal Framing) be certified Associate Welding Inspectors as defined by AWS (American Welding Society) or have a higher certification by AWS unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Structural Engineer.
 - a. Steel Inspection Technicians shall have passed within the last 2 years an eye examination with or without corrective lenses to verify the Technician has near vision acuity of Snellen English or equivalent at no less than 12 inches, and far vision acuity of 20/40 or better.
 - b. Steel Inspection Technicians inspecting bolts shall have a minimum 2 years of experience inspecting bolts as part of regular inspections of structural steel systems.
 - c. Steel Testing Technicians performing non-destructive testing of welds other than visual shall be certified NDT Level II Technicians in accordance with the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A.
- B. SITA Scope: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement (e.g. a copy of a fully executed agreement between the Owner and the SITA, or an email from the Construction Materials Engineer to the Architect) for approval by the Architect, indicating that the SITA will perform all work specified in Section 01 4533 to be performed by the SITA. An example of an acceptable statement is, “Our firm will provide all work specified in Section 01 4533 to be performed by the SITA for the [insert project name] located at [insert project address], Huckabee project number [insert project number].”
- C. It shall be permitted for the SITA to provide one statement regarding both qualifications and scope.

1.08 APPROVAL OF CXA QUALIFICATIONS AND SCOPE

- A. CxA Qualifications: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement for approval by the Mechanical and Electrical Engineers indicating that the CxA firm and CxA Staff that will be assigned to this

project will meet the qualifications required by Division 01 and Divisions 22-26.

- B. CxA Scope: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement (e.g. a copy of a fully executed agreement, or an email from the CxA) for approval by the Mechanical and Electrical Engineers, indicating that the CxA will perform all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA. An example of an acceptable statement is, "Our firm will provide all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA for the [insert project name] located at [insert project address], Huckabee project number [insert project number]."
- C. It shall be permitted for the CxA to provide one statement regarding both qualifications and scope.

1.09 CONTRACTOR'S GENERAL RESPONSIBILITIES

- A. It shall be the Contractor's sole responsibility to comply with all requirements of the Contract Documents, without relying on any of the quality control services required by Section 01 4533. The purpose of quality control services is to simply provide some verification that the Contractor is complying with the Contract Documents.
- B. As required by the International Building Code, the Contractor shall submit to Midlothian ISD, the Building Official (AHJ), and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control".
 - 1. This statement shall identify this project as " Project Title", including Architect's project number.
 - 2. The statement shall either include the following language or similar language: "As the Construction Firm responsible for the construction of this project, we acknowledge that we are aware of all the requirements of Specification Sections 01 1400 and 01 4533. In addition, we acknowledge that all firms currently under contract as Subcontractors to our firm on this project are also aware of the requirements of Specification Sections 01 1400 and 01 4533. We further acknowledge that we will make any firms we contract with in the future for this project also aware of these requirements prior to commencement of their scope of work."
- C. If any steel fabrication occurs off-site (at a fabrication shop) that is not an AISC certified fabrication shop, the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication.
- D. The Contractor shall notify quality control personnel at least five (5) business days before they need to visit the site to perform their services. In addition, the Contractor shall cooperate with quality control personnel, provide incidental labor, equipment and facilities to give them access to the work (including ladders and lifts), and provide space onsite for their operations and storage.
 - 1. If the Contractor does not request quality control services where required, the work that was not inspected and/or tested shall be considered deficient and the Contractor shall issue an RFI to the Architect immediately when the Contractor becomes aware of this deficiency.
- E. The Contractor shall make accessible and visible all work requiring quality control services until all deficiencies are corrected or otherwise fully addressed.
- F. Addressing Deficiencies in SITA Reports: The Contractor shall fully address all deficiencies noted by the SITA and notify the SITA when and how each deficiency was addressed. It shall be permitted to either correct the work in the presence of the SITA, provide evidence to the SITA that there was in fact no deficiency if that is the case, provide evidence to the SITA that the appropriate Design Professional(s) have determined that the deficiency from the contract documents is acceptable, or provide evidence to the quality control entity (e.g. SITA, CxA, or the respective design professional) that a remediation plan was approved by the appropriate

Design Professional(s) and then constructed.

G. Addressing Quality Control Observations:

1. The Contractor shall be responsible for addressing any observations verbally noted by Design Professionals during site visits as if these observations were noted in writing. If the Contractor would like a written record of those observations, the Contractor shall submit a record of their understanding of the conversation to the Architect and Design Professional.
2. The Contractor shall be responsible for determining if any observations identify or provide evidence of any deficiencies (discrepancies from the contract documents).
3. All deficiencies associated with observations by Design Professionals shall be addressed by the Contractor.
4. Except for items noted by a Design Professional that are identified in an observation report as "registered", the Contractor is not required to notify the Design Professional when deficiencies that are associated with observations by Design Professionals have been addressed in good faith by the Contractor. It shall be acceptable for the Contractor to address such items by correcting the discrepancy from the contract documents or determining that a deficiency does not in fact exist. Alternatively, it shall also be acceptable for the Contractor to issue an RFI proposing acceptance of the deficiency or a remediation, and then remediating if approved.
 - a. If the Design Professional requests at any time written correspondence that the Contractor has addressed deficiencies associated with any or all observations, the Contractor shall determine whether or not such deficiencies were addressed, resolve any deficiencies that were in fact not yet addressed, and then provide written correspondence indicating that all deficiencies associated with observations by the Design Professional have been corrected when all deficiencies have been corrected.
5. The Contractor shall correct or otherwise fully address all items noted by Design Professionals that are identified in an observation report as "registered". After registered items have been corrected or otherwise fully addressed but before the Contractor is permitted to install construction which obstructs view of the correction or noted condition, the Contractor shall submit to the Design Professional acceptable evidence of how the item was addressed. The Design Professional shall be the sole determinant of what is considered acceptable evidence and the Design Professional may require a follow-up site visit to make observations. Examples of acceptable evidence might be a photograph emailed by the Contractor, a report from the SITA, or a conversation with the Architect's representative.

H. If deficiencies are brought to the Contractor's attention by quality control personnel, the Contractor shall issue a Request For Information (RFI) to the Architect if direction is needed to resolve the item. This RFI shall include the Contractor's suggested course of action to address the deficiency. Unless the Contractor completely removes nonconforming work and replaces it with conforming work, it is the Contractor's responsibility to hire design professionals as required to design any remediation preferred by the Contractor, to be submitted to the Architect for consideration. This RFI may also include a request for acceptance of the deficiency based on an evaluation by the appropriate project design professional(s) such as the Structural Engineer of Record. The entire cost and schedule impact of any deficiencies identified by inspections and/or tests shall completely be the responsibility of the Contractor, at no additional cost to Midlothian ISD. Midlothian ISD reserves the right to assess liquidated damages associated with any and all delays due to addressing deficiencies.

1. If the Contractor would like Design Professional(s) such as the Structural Engineer of Record to design a remediation in lieu of the Contractor hiring design professionals, it shall be permitted for the Contractor to make this request in the RFI. However, project

design professional(s) shall have no obligation to design any remediation and shall be permitted to charge for design services. The Contractor shall provide a deadline for the requested design in the RFI, or it may be assumed that the schedule of this resolution is not time-sensitive. If the project design professional(s) do not produce an approved remediation design by this deadline (even if there is no response to the RFI), the Contractor shall either remove nonconforming work and replace it with conforming work or hire design professionals to design a preferred remediation to be submitted for consideration by the Architect. The Contractor shall be responsible for any delays due to attempts by project design professional(s) to design remediation's by the requested deadline.

- I. The Contractor shall pay for all re-inspections and re-tests performed after quality control personnel have identified deficiencies, regardless of who is paying for the basic quality control services. The Contractor shall also pay for any tests, inspections and/or observations not required by Section 01 4533 but requested by the Contractor.
- J. The Contractor shall be responsible for paying (either directly or by reimbursing the Owner or Architect) for all additional services by quality control personnel associated with addressing deficiencies.
 - 1. Design Professionals shall be permitted to bill the Contractor at their standard hourly rates and it shall be the Contractor's responsibility to realize that the Contractor shall be responsible for paying for any time a Design Professional spends performing additional services such as responding to RFI's regarding deficiencies, attending meetings regarding deficiencies, making site visits to address deficiencies.
 - 2. In general, many Design Professionals do not charge for these services; however, on this project, Design Professionals shall be permitted to bill or not bill the Contractor at their discretion and the Contractor shall be required to pay all such bills.
 - 3. Design Professionals are not obligated to inform the Contractor in advance what that Design Professional's standard hourly rates are or how much time will be spent or even whether or not that Design Professional intends to submit a bill; the Contractor shall be obligated to ask Design Professionals how much time a task may take and otherwise keep track of these items if the Contractor desires to consider hiring a different Design Professional to assist them in addressing deficiencies.
 - 4. These additional services are often short duration items scattered over a long period of time; the Design Professionals shall be permitted to send the Contractor a bill for all services associated with addressing deficiencies at the end of the project before a Certificate of Final Completion is issued. The Owner shall be permitted to pay for these services out of the Contractor's Retainage.

1.10 SITA'S GENERAL DUTIES AND RESPONSIBILITIES

- A. Role: The Special Inspection and Testing Agency (SITA) shall provide Construction Materials Engineering services, with a Construction Materials Engineer that directly supervises all SITA responsibilities and evaluates whether or not reports from inspections and/or tests conform with construction requirements in the drawings and specifications related to the specific inspections and/or tests required by Section 01 4533.
 - 1. It shall be the Contractor's sole responsibility to comply with all requirements of the Contract Documents, without relying on any of these quality control services. The purpose of the quality control services provided by the SITA is to simply provide some verification that the Contractor is complying with the Contract Documents.
 - 2. For clarification, acting under the supervision of the SITA's Construction Materials Engineer, the SITA's personnel shall be permitted to use judgment and experience when measuring dimensions and locations of elements where required by this specification section, to verify conformance with the design intent rather than measuring all instances.

For example, where Section 01 4533 requires that the SITA verify locations and or dimensions of all elements for a certain type of construction, it shall be acceptable for the SITA personnel to field measure only a fraction of those dimensions (e.g. "random sampling") when non-measured conditions visually appear to conform, measuring at a frequency determined by the SITA to be appropriate using judgment and experience (rather than field measuring every dimension). Furthermore, the SITA may increase or decrease the frequency of these field measurements depending on how often deficiencies are encountered.

3. The SITA shall not be permitted to release, revoke, alter, or enlarge on any requirements of Contract Documents; approve or accept any portion of the work; or, assume any duties of the Contractor. The SITA shall not have the authority to stop the work.
- B. Contractor's Work Restrictions: The Work Restrictions in Section 01 1400 related to Quality Control require that the Contractor obtain certain documents from the SITA and host certain meeting that the SITA attends, before certain construction milestones for the project to proceed. The SITA shall cooperate with the Contractor, providing those items and attending those meetings within a reasonable time frame.
- C. Pre-Construction Meetings: The SITA shall participate (in person or on the phone) at the Foundation Pre-Construction Meeting, Quality Control Pre-Construction Meeting, and Framing Pre-Construction Meeting.
- D. SITA Reports: After each special inspection or test, the SITA shall issue a report electronically to the Architect, Contractor, and the Design Professional requiring the report (e.g. concrete cylinder test reports for the foundation shall be submitted to the Structural Engineer), and anyone else the Architect indicates should be included in the distribution (e.g. AHJ, Owner, Construction Observer, etc...). These reports shall include the project title and number and information deemed appropriate by the Construction Materials Engineer.
- E. Addressing Deficiencies:
 1. The SITA shall notify the Architect, Contractor and the Design Professional requiring the quality control, of observed deficiencies or non-conformance of work or products.
 - a. A draft report of any deficiencies noted during inspections shall be provided to the Contractor on-site in writing (using the method(s) previously agreed to with the Contractor) before the special inspector leaves the site that day.
 - b. A final report of inspections shall be issued within five (5) business days of on-site visits. A report of tests performed shall be issued within five (5) business days of performing tests.
 2. Re-inspection and/or re-testing required because of Contractor's non-conformance to the Contract Documents shall be performed by the SITA and shall be paid for by the Contractor. In the event that this occurs, the SITA shall invoice the Contractor directly unless the Owner has indicated it is acceptable to simply bill the Owner and make note that the Owner should be reimbursed for the additional services.
- F. The SITA shall provide appropriate quality control staff on-site within five (5) business days of any request by the Contractor to perform inspections and tests required by Specification Section 01 4533, including any re-inspections, retests and/or repeat structural observations.
 1. The Contractor shall be responsible for requesting all site visits necessary for the SITA to perform all quality control services.
 2. If the Contractor does not request inspection, testing, and/or structural observation where required, the work that was not inspected, tested, and/or observed, shall be considered deficient.
- G. The SITA shall issue a report to the Architect, Structural Engineer and Contractor if inspection and/or testing indicates that work conforms or does not conform with the contract documents.

1. If work that is required to be inspected or tested is covered or made permanently inaccessible by the Contractor prior to inspection or testing by the SITA, it shall be assumed that the covered work is non-conforming.
- H. The SITA shall comply with the requirements for issuing a Final Report of Special Inspections and Testing required by Section 01 4533.

1.11 QUALITY CONTROL OBSERVATIONS

A. General

1. The Contractor shall notify every quality control observer (e.g. the CxA and every Design Professional) at least five (5) business days before project conditions are ready for every site visit to make observations that those individuals would like to make.
2. Quality control observers shall be permitted to issue a written observation report or simply note items verbally in a conversation with any representative of the Contractor onsite. The Architect and/or the Contractor may request written observation reports; however, each Design Professional shall be the sole determinant of if or when written observation reports are issued.

B. Schedule of Site Visits

1. Before the Quality Control Pre-Construction Meeting, the Contractor shall request from the CxA and every Design Professional a description of project conditions which are associated with every desired site visit. (For example, the Structural Engineer may indicate that after rebar is installed for the first grade beam pour but before concrete is poured, he or she would like to send an Engineer-In-Training or an Observer to the site to make observations.)

C. Scope of Observations

1. Site visits desired by Design Professionals but not specifically listed as required in Section 01 4533 are not code-required site visits (e.g. Structural Observations from regular visits by the Structural Engineer or his/her representatives are not the Code-Required Structural Observations listed in other portions of Section 01 4533).
2. The observations are visual observations by the Design Professional, or their representative, of the systems which were designed by the Design Professional and are under construction or were recently constructed, for some verification that this work general conforms to the approved construction documents.
3. The determination of which conditions to note during observation shall be made at the sole discretion of the Design Professional or their representative. These observations may be limited to clear indications noted in which the observer believes the Contractor misunderstood the design intent and the misunderstanding is about a significant requirement. The Design Professional shall not be responsible for identifying any and all significant deficiencies.
4. In written observation reports, the Design Professional shall be permitted to identify certain conditions as "registered" (e.g. registered deficiency, registered observation, registered item, etc...) at the Design Professional's discretion. The Contractor shall fully address all items noted, regardless of whether they are noted as registered or not; however, the Contractor shall provide the Design Professional with evidence that registered items have been fully addressed and ask the Design Professional if that evidence is sufficient, which provides a higher level of quality control.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 QUALITY CONTROL PRE-CONSTRUCTION MEETING

- A. The Contractor shall schedule a "Quality Control Pre-Construction Meeting" with the SITA's Construction Materials Engineer, CxA, Structural Engineer (or a representative of), and the Architect's Construction Observer. Before scheduling the meeting, the Contractor shall ask the

Owner if a representative of the Owner would like to attend. It shall be permitted for people to attend in person or by conference call. During this meeting:

1. The Contractor shall review the approval status of the qualifications and scope statements from the SITA and CxA with all attendees.
2. The Contractor shall acknowledge their responsibility to request site visits for all inspections and tests required by Specification Section 01 4533 before work is made inaccessible or covered. The Contractor shall also acknowledge their responsibility to address all deficiencies.
3. The Contractor, SITA and CxA shall acknowledge their responsibilities to comply with the requirements for Final Reports of Quality Control from firms providing quality control service in Section 01 4533.
4. The Contractor shall provide the construction schedule to all attendees. If this schedule changes during construction, the Contractor shall notify quality control personnel.
5. The SITA and CxA shall summarize their understanding of how Specification Sections 01 1400 and 01 4533 shall be applied to this project.
6. The Contractor shall summarize their understanding of when the Contractor is required to request SITA, CxA and Design Professional site visits for inspections and/or tests.
7. The Architect's Construction Observer shall determine if the site visits described for Design Professionals hired by the Architect generally comply with the Owner-Architect Agreement.
8. The Contractor shall acknowledge their obligation to notify Design Professionals how observations are addressed when observations are noted on reports as "registered".
9. The Contractor and SITA shall determine collaboratively with each other a mutually agreed upon method for SITA technicians to provide the Contractor with written draft reports of any deficiencies before the technician leaves the site on the day the deficiencies are observed. This method shall not require Contractor's staff to be on-site to receive this draft report. As an example, this could include emailing a specified Contractor email address from smart phones or placing a hard copy of reports in a specified Contractor box outside the job trailer.
10. The SITA and CxA shall each determine collaboratively with the Contractor when the last report from each firm (regarding any portion of the project) is likely to be issued.

3.02 QUALITY CONTROL SPECIFIED BY THE DESIGN PROFESSIONALS

- A. Within 7 days after the Foundation Pre-Construction Meeting, the Contractor shall notify the SITA of any special inspections and testing required by delegated design professionals. The SITA shall perform all quality control required by each delegated design professional (hired by the Contractor) to be performed by the SITA. The delegated design professionals shall require quality control that they, in their professional opinion, believe appropriate for the SITA to perform given the nature of the work with consideration given to their understanding of the local industry standard of care. Proposers (potential Contractors) shall assume for proposal purposes that each delegated design professional will require the full scope of special inspections and testing (and structural observation if applicable) listed in the material specific sections and tables of Chapter 17 of the IBC unless told otherwise by the delegated design professional before Proposers submit proposals.
- B. Where special inspection and testing is specified by other design professionals (e.g. Architect, Structural Engineer, Civil Engineer, MEP Engineer, etc...) to be performed by the SITA for delegated design items, this work shall be performed at a minimum but shall not be a substitute for the quality control program required by the delegated design professional.

3.03 QUALITY CONTROL SPECIFIED BY THE STRUCTURAL ENGINEER

- A. Scope: The quality control required by the Structural Engineer shall apply to all work sealed by the Structural Engineer of Record, the individual who sealed the "S" Sheets.

- B. Special Inspections for Soils
1. Reference SITA Scope on the Drawing Sheets: The SITA shall perform special inspection and testing of the soil below the carton void forms and the subgrade in the crawlspace as required by the Civil Engineer on the Civil Drawing sheets for general site grading and fill, with utility trench backfill as required by the Mechanical and Electrical Engineers on the MEP Drawing sheets as well as the Technology Consultant on the Technology Drawing sheets.
 2. Coordination with the Geotechnical Engineer: The SITA shall coordinate inspections and testing of soil with observations by the Geotechnical Engineer, regardless of whether the Geotechnical Engineering Firm is the same firm or a different firm from the SITA firm. The Contractor shall contact the Geotechnical Engineer before the Quality Control Pre-Construction Meeting to determine when the Geotechnical Engineer recommends observations and communicate the schedule on these Geotechnical observations to the SITA. The Contractor shall then notify the Geotechnical Engineer at the appropriate times so that the Geotechnical Engineer can make observations onsite. Where the Geotechnical Engineer recommends that the Geotechnical Engineer be onsite to confirm items (e.g. appropriate depth of a strata, appropriate condition of a strata, anticipated subsurface water conditions, etc...), the SITA shall not perform inspections and testing associated with those items until the Geotechnical Engineer has made such observations.
- C. Deep Foundation Elements and Footings
1. The SITA shall observe the installation of all deep foundation elements and/or footings and record all information necessary for the SITA to provide a reliable cost reconciliation by linear foot for each type of deep foundation element and cubic yard of excavation and reinforced concrete for footings. This information shall include the elevation of the grade at the time of drilling, which the SITA may obtain from the Contractor. This information shall also include the elevation of the the bottom of steel casing (or depth below grade at a known elevation), when casing is used. The SITA shall be the sole determinant in the field, for each deep foundation element and for all footings, when sufficient bearing material has been reached and the SITA shall identify for the Contractor, during drilling/excavation, the highest elevations that the SITA considers acceptable so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment). The SITA shall be the sole determinant in the field, for each deep foundation element, when casing is required and the SITA shall identify for the Contractor, during drilling, the fewest piers the SITA considers necessary to case and the highest elevations that the SITA considers acceptable for the bottom of casing at each pier so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment).
 2. After the Contractor indicates that the last Deep Foundation Element has been installed, the Contractor shall request a Deep Foundation Element Reconciliation Report from the SITA. The SITA shall then provide a tabulation of the difference between assumed and actual conditions for the total cumulative length of uncased deep foundation elements, and cased piers where applicable, for each diameter and reinforcement pattern. The Contractor shall then calculate the change in cost associated with the Pier Reconciliation Report from the SITA and then submit a Request for Information, asking the Architect and any appropriate Design Professionals to review the report and proposed cost change before a Proposed Cost Revision is submitted.
- D. Special Inspections and Testing for Concrete Construction
1. Before requesting that SITA personnel visit the site to make inspections of concrete work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and concrete mix design submittals that have been reviewed by the specifying

- Engineering Firm. The Contractor shall give the SITA sufficient time and lighting at the site, as deemed necessary by the SITA, to perform the specified inspections and testing.
2. The SITA shall provide the following inspections and testing for concrete construction.
 - a. Before every concrete pour (generally the same day of the pour unless the SITA deems the scope of the pour to be too large), the SITA shall visit the site and inspect the reinforcement for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, concrete cover, etc...at a random sampling to be determined by the SITA). While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to anchor bolt embedment, steel embed plate type and location, formwork, concrete accessories, debris, etc....
 - b. During concrete pours, for each intended use (e.g. footing, grade beam, interior slab on grade, etc...), the SITA shall sample concrete from the first concrete truck on each day of concrete pouring and shall determine which other concrete trucks they will sample each day, if any. The SITA shall, however, sample trucks so that no more than 150 cubic yards of concrete is placed at a time without being sampled (e.g. sampling every 150 cubic yards). While onsite, the SITA shall be empowered but shall not be obligated to make comments during inspections regarding related conditions, including but not limited to unsafe conditions, age of concrete in trucks after batching before poured, vibration of concrete, hot weather and cold weather concrete placement methods, temperature and wind speed for the pour that day, and curing conditions for previously poured areas.
 - c. For each truck that is sampled, the SITA shall do the following and notify the Contractor immediately of any deficiencies so that the Contractor has an opportunity to address those deficiencies:
 - 1) Collect a copy of the batch ticket and verify that the mix design matches the reviewed submittal for the intended use;
 - 2) Collect a sample in accordance with ASTM C172.
 - 3) Perform a slump test in accordance with ASTM C172 and verify that the slump is within the range on the submittal;
 - 4) Perform an air content test in accordance with ASTM C231 or ASTM C173 and verify the air content is within the range on the submittal;
 - 5) Record the concrete temperature;
 - 6) Fabricate cylinders molded and standard-cured in accordance with ASTM C31. Each set of cylinders shall consist of either four cylinders that are 6" in diameter and 12" tall or five cylinders that are 4" in diameter and 8' tall. The Contractor shall be responsible for providing a portion of the site to the SITA for cylinder storage; however, the proper temperature and humidity of curing of all test cylinders and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory. All test cylinders shall be stored in the field 24 hours and then be carefully transported to the laboratory and cured in accordance with ASTM C31.
 - 7) The Contractor shall have the option to pay the SITA to perform additional inspections and testing, such as additional concrete cylinders whenever desired to determine early strengths. The Contractor shall be responsible for any additional cylinders required to comply with OSHA requirements.
 - d. or each set of concrete cylinders fabricated, the SITA shall perform compression strength testing in accordance with ASTM C 39 with one (1) cylinder at 7 days and

either two (2) 6" diameter cylinders or three (3) 4" diameter cylinders at 28 days. The SITA shall hold one cylinder in reserve and test the reserve cylinder at 56 days only if the average of the 28 day cylinder strengths is below the specified strength and the specifying Engineer indicates it is acceptable to test at 56 days rather than waiting a longer period of time.

E. Special Inspections and Testing for Masonry Construction

1. Before requesting that SITA personnel visit the site to make inspections of masonry work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and mortar/grout mix design submittals that have been reviewed by the Structural Engineering Firm. The Contractor shall notify the SITA of the rate of masonry construction as it occurs so that the SITA is onsite the first day of structural masonry work and no more than 5,000 square foot of structural masonry is constructed at a time without the SITA being onsite for inspections and testing (e.g. notifying the SITA every 5,000 square feet). The Contractor shall also coordinate the SITA site visits such that structural masonry work is occurring (e.g. masons are installing masonry) when the SITA is performing inspections and tests. Structural masonry for the purposes of quality control is hereby defined as all reinforced concrete masonry walls which are exterior walls and load-bearing walls.
2. The SITA shall provide the following inspections and testing for masonry construction:
 - a. The first day of masonry work, the SITA shall observe the mason mixing the first batches of both mortar and grout, verifying the following (with the mason preparing a batch of mortar or grout for inspection purposes only, to be discarded, if no mortar or grout is needed that day):
 - 1) the ingredients appear to be consistent with the reviewed mix submittals (e.g. the type of cementitious materials listed on bags appear correct);
 - 2) the volumetric proportions are consistent with the reviewed mix submittals; and,
 - 3) containers with known volume are used when batching (allowing the mason to assume that a bag of cement weighing at least 92 pounds is a cubic foot), verifying that shovels are not used when proportioning sand or gravel.
 - b. At every visit for inspections and testing of masonry construction, the SITA shall do the following:
 - 1) Inspect bedjoint reinforcement and vertical as well as horizontal conventional reinforcement where work is exposed (i.e. constructed but not obstructed from view with grout or masonry) for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, masonry cover, etc...at a random sampling to be determined by the SITA);
 - 2) Inspect grout spaces to verify they are clear of debris;
 - 3) Sample grout and fabricate a set of three (3) grout prisms (grout only, formed with CMU on all sides, and not a masonry prism which is constructed with two units and a mortar joint) and test in the lab at 28 days in accordance with ASTM C 1019. The Contractor shall be responsible for providing a portion of the site to the SITA for prism storage; however, the proper temperature and humidity of curing of all test prisms and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory.
 - (a) every time grout is sampled to make prisms, the SITA shall perform a slump test and verify that the slump is greater than 8".
 - 4) While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions,

including but not limited to use of integral water repellant in mortar mixes where specified, mortar mixing, grout mixing, grouting where post-installed anchors will be required, anchor bolt embedment of embedded anchor bolts, steel embed plate type and location, masonry accessories, veneer anchors, debris, lift height for grouting, age or segregation of mortar or grout when placed, vibration, hot weather and cold weather practices, material certification for masonry units, proper face-shell bedding, bracing of previously constructed non-loadbearing masonry walls, and curing conditions for previously constructed walls.

- 5) Mortar cubes and masonry prisms are not required. If the SITA produces mortar cubes or masonry prisms without the Owner's authorization, the Owner will not pay for mortar cube preparation or mortar cube testing. The Contractor shall be permitted to request and pay for mortar cubes or masonry prisms, if the Contractor desires.

F. Special Inspections and Testing for Steel Construction

1. Before requesting that SITA personnel visit the site to make inspections of structural steel work, the Contractor shall electronically send to the SITA copies of the welding certifications for every steel welder that will be onsite, manufacturer certification for every adhesive anchor installer that will be onsite and any applicable structural steel submittals that have been reviewed by the Structural Engineering Firm. Upon receipt of the welding certifications, the SITA Staff shall verify these welders have passed qualification tests with the last year using procedures covered in the American Welding Society "Structural Welding Code - Steel," D1.1, latest version. Upon receipt of the adhesive anchor certifications, the SITA Staff shall verify these installers do not have an expired certification. The inspector (acting under the supervision of the Construction Materials Engineer) shall be permitted to accept alternative experience and/or on site demonstration of competency if qualified in the opinion of the inspector.
2. Inspection and Testing at Non-AISC Fabrication Shops: If any steel fabrication occurs off-site at a fabrication shop that is not an AISC certified fabrication shop (excluding Steel Joist Institute facilities manufacturing steel joists), the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. The Contractor shall notify the SITA when fabrication of steel is scheduled to begin at these facilities. The SITA shall visit these facilities at the beginning of steel work within those facilities and review the quality assurance / quality control documentation at that facility (e.g. processes, welder certifications, logs of welding inspections, etc...). The SITA Staff, acting under the supervision of the Construction Materials Engineer, shall then determine how much (if any) of the specified inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction, and then perform that scope of work after communicating to the Contractor when the SITA is to be notified for inspections at the shop. For proposal purposes, Steel Fabricators with non-AISC shops shall assume that the SITA Staff will require the full scope of inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction.
3. On-Site Inspection and Testing: The Contractor shall notify the SITA of the status of steel construction as it occurs so that the SITA is onsite after defined areas of the structural steel portion of the project are complete (with the exception that the SITA must be present during the installation of any overhead adhesive anchors), notifying the SITA of any work within those areas that is to be completed at a later date. The Contractor shall not cover up portions of steel construction until the SITA has performed quality control services without identifying any deficiencies at those areas. By the end of the project, the Contractor shall have scheduled visits from the SITA for steel inspection and testing of all

structural steel construction (including all miscellaneous steel members but not including cold formed metal framing) that occurred on-site. During each site visit, the SITA shall do the following:

- a. Verify off-site fabrication occurred at an AISC certified fabrication shop (by obtaining a copy of the shop's certificate), unless the SITA has provided the specified inspection and testing services at the fabrication shop.
- b. Structural Steel Members: Verify that the structural steel framing member sizes and locations generally conform to the reviewed steel submittals.
- c. Welds that are not Full Penetration welds: Out of all the welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds to visually inspect (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall inspect at least 10% of each type of weld. The SITA shall be permitted to inspect up to 100% of each type of weld if the SITA Staff believe appropriate, based on the conditions observed. The Contractor shall clean all welds identified for visual inspection by the SITA. Visual inspection of welds shall include but not be limited to alignment of members, weld size, length, location, weld/base-metal fusion and signs of cracking.
- d. Welds that are Full Penetration welds:
 - 1) the Contractor shall clean all full-penetration welds. The SITA Staff shall visually inspect all full-penetration welds.
 - 2) out of all the full-penetration welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds receive Ultrasonic Testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall perform Ultrasonic Testing on at least 10% of each type of full-penetration weld (e.g. normal full-penetration, flare vee, etc...). The SITA shall be permitted to perform Ultrasonic Testing on up to 100% of each type of full-penetration weld if the SITA Staff believe appropriate, based on the conditions observed.
- e. Bolts:
 - 1) Load-Indicator Type Bolts: Out of all the load-indicator bolts in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which load-indicator bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of load-indicator bolt. The SITA shall be permitted to visually inspect up to 100% of the load-indicator bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection and testing of load-indicator bolts shall include verification that the grade, diameter, location, and minimum length generally conform with the reviewed steel submittals, and that the splines have been snapped off to indicate proper torquing. If any steel to steel connections do not utilize load-indicator type bolts, this section shall apply.
 - 2) Anchor Bolts that are not Overhead Adhesive Anchor Bolts: Out of all the anchor bolts (including base plate anchor bolts, expansion bolts, and adhesive anchor bolts but excluding overhead adhesive anchor bolts) in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which anchor bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of anchor bolts. The SITA shall be permitted to visually inspect up to 100% of the anchor bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection

and testing of anchor bolts shall include verification that the bolts are snug tight in the opinion of the SITA, wedge anchors are fully torqued and no longer able to rotate, and verification that the grade, diameter, location, and minimum length beyond the nut generally conform with the reviewed steel submittals.

- 3) Overhead Adhesive Anchors: The SITA Staff shall be present during the installation of all adhesive anchors oriented vertically such that the anchors are in tension, if there are any such anchors on the project. During the installation, the SITA shall visually inspect the bolts as with all other anchor bolts and inspect the installation, commenting if the installation does not appear to be consistent with the manufacturer's recommended installation procedures.

- f. Metal Deck: For all metal deck, verify the type, gauge, finish, weld pattern and sidelap connections conform with the reviewed deck submittals.
- g. While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to unsafe conditions, counterfeit steel members and/or bolts, galvanized steel being cut/scratched/welded (which is not permitted), exterior exposure of non-galvanized material that is not to be painted, welding procedures, steel angle supports around openings in metal deck, deck closures, fire protection, removal of backer plates, grinding of exposed welds, temporary or permanent bracing, and visual acuity of welders.

3.04 **QUALITY CONTROL SPECIFIED BY THE CIVIL ENGINEER**

- A. Reference Civil drawings for quality control required by the Civil Engineer.

3.05 **QUALITY CONTROL SPECIFIED BY THE MECHANICAL AND ELECTRICAL ENGINEERS**

- A. The CxA shall visit the site to make observations as specified by Section 01 9100, Section 01 4533 and Divisions 22-26.

3.06 **FINAL QUALITY ASSURANCE REPORTS**

- A. General

1. Before applying for a Certificate of Occupancy, the Contractor shall obtain a Final Report from each of the following quality control firms and submit them all at one time to the AHJ:
 - a. SITA, Final Report of Special Inspections and Testing
 - b. CxA, Final Report of Commissioning
 - c. Structural Engineer, Final Report of Structural Engineering Observations
 - d. Mechanical Engineer, Final Report of Mechanical Engineering Observations
 - e. Electrical Engineer, Final Report of Electrical Engineering Observations
2. Quality assurance personnel shall not be required by the AHJ to issue any certifications, guarantees, or warranties because that is not in their scope of work. Specific language or formatting of the final report shall not be considered a requirement by the AHJ for this project unless the AHJ indicates otherwise before a building permit is issued. (If specific language is desired, quality assurance personnel would need to understand that specific language before performing their scope of work to ensure that they can accurately write a letter with that language.)
3. The Final Report from every firm providing quality control services shall be sealed by a Professional Engineer licensed in the State of Texas and shall indicate, if it is true, that the author of the Final Report:
 - a. Represents the firm, identifying which quality control services were provided by that firm,
 - 1) Has reviewed all previous reports and believes all of the quality control services required by Section 01 4533 to be performed by their firm have been performed,
 - 2) Has reviewed all previous reports and believes there are no unresolved deficiencies, and,

- 3) To the best of his or her knowledge, regarding the portion of the project associated with their scope of work, they believe the construction conforms.
 - (a) The SITA shall indicate they believe the results of inspections and testing were within project specifications.
 - (b) Quality control observers shall indicate they believe the construction generally conforms with the contract documents.
 4. An example of acceptable language in a Final Report is as follows:
 - a. For the SITA: "I am the Construction Materials Engineer representing [insert SITA firm's name], which was responsible for providing Special Inspections and Testing Agency (SITA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the SITA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm's scope of work, I believe the results of inspections and testing were within project specifications."
 - b. For the CxA: "I am the individual representing [insert CxA firm's name], which was responsible for providing Commissioning (CxA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the CxA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm's scope of work, I believe the construction generally conforms with the contract documents."
 - c. For the Structural Engineer, Mechanical Engineer and Electrical Engineer: "I am the [insert project role] representing [insert firm's name], which was responsible for providing observations for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I and/or a representative of my firm visited the site at certain stages of construction and made observations. The Contractor is obligated to address all of my observations and has indicated to me that this was done. Therefore, to the best of my knowledge, I believe the construction related to my role generally conforms with the contract documents."
- B. Request for Final Report
1. Within 48 hours of receiving the last inspection, test or observation report expected for the project (regarding any portion of the project) from each firm providing quality control services, the Contractor shall issue an RFI requesting a Final Report of Quality Control from that firm. For clarification, the Contractor shall not be permitted to wait until the end of the project or even until all quality control firms have completed their work. The Contractor shall be responsible for addressing any unresolved deficiencies and submit a written statement to all quality assurance observers in the RFI that their observations were fully addressed before requesting this report from each firm. For proposal purposes, the Contractor shall assume that within ten (10) business days each firm providing quality control services will either issue this report without any unresolved deficiencies or identify in writing any known but unresolved deficiencies. If any unresolved deficiencies are identified during this process, the Contractor shall address these deficiencies and then request a final report again.
 2. When the Contractor requests a Final Report of Quality Control from each quality control firm, quality control personnel shall verify that the scope of quality control services

required by Specification Section 01 4533 was performed and that any deficiencies identified have been addressed.

- a. If it appears there are no unresolved deficiencies, the firm shall create and distribute a Final Report within ten (10) business days of receiving the request from the Contractor for the final report. The final report shall be sealed by a professional engineer licensed in the state of Texas and shall be distributed to the Contractor and the Architect.
- b. If the firm determines that there are unresolved deficiencies, the firm shall notify the Contractor within ten (10) business days of receiving the request from the Contractor for the Final Report that a Final Report cannot be provided until all unresolved deficiencies are resolved. It is preferred but not required that the firm also provide the Contractor a complete list of all deficiencies identified by the firm to date.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.
- H. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 2100 - Allowances

1.03 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes including review and inspection of work.
- B. New permanent facilities may not be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. New permanent facilities may not be used during construction operations.
- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas., to allow for owner's use of siteProtect existing facilities and adjacent properties from damage from construction operations and demolition. Implement safety precautions that comply with all regulatory requirements.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. On sites where students are present, no work shall commence prior to fence being in place.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- G. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. If materials to be recycled or re-used on the project must be stored on-site, provide suitable and secure non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. No later than ten (10) days after the Notice to Proceed, and prior to start of construction, provide a job sign at the job site.
- B. Request sign layout and details from the Architect.
- C. Reference Section 01 2100 - Allowances for cash allowance for project sign.
- D. Contractor shall be responsible to pick up sign.
- E. Provide project identification sign of design and construction indicated on Drawings.
- F. Erect on site at location indicated.
- G. No other signs are allowed without Architect's permission except those required by law.

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack .
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Provide separate work station similarly equipped and furnished, for use of Architect..
- D. Locate offices a minimum distance of 50 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to final punch list and review inspection.
- B. Remove underground installations to a minimum depth of 3 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5723

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:
Section 31 0000 - Earthwork

1.02 QUALITY ASSURANCE

- A. 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 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations and procedures.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

- A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content Current Edition.
- B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc. 2016.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Shop drawings, product data, and samples under provisions of Section 01 3000.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.
 - 1. If reuse of other existing materials or equipment is desired, submit substitution request.
 - 2. All items called for on the drawings to be salvaged, removed and relocated shall be inventoried, removed and stored until such time as they are to be installed in their new location. The inventory list shall be given to the Owner and shall include an itemized list that includes quantities, descriptions and condition of each item. These items are considered to be in good operating condition at the time the contract is signed, and shall remain the property of Owner. These items shall be properly protected by the contractor and removed by him, complete, including all appurtenances and reinstalled in their new location in good working order with any modifications called for by the drawings.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 2. Have longer documented life span under normal use.
 - 3. Result in less construction waste.
- C. Provide interchangeable components of the same manufacture for components being replaced unless noted otherwise in the contract documents.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. All substitutions shall be submitted on the Architects form as described in paragraph 3.03.
- B. Product Substitution - Prior to Bid
 - 1. No products shall be used on the project unless they are specified or have received prior approval.
 - 2. Products to be reviewed prior to bid shall be submitted and reviewed under the provisions of this section.
 - 3. Substitution request including all required documentation must be delivered to the Architect's office no later than ten (10) calendar days prior to the proposal date designated in the project manual. Requests submitted late will not be considered.
 - 4. No product will be considered "as equal" to the product specified until it has been included as an allowable substitution, in a written Addendum to the project.
- C. Product Substitution - Post Contract Award
 - 1. Product substitutions are not allowed except for the following provisions:
 - a. Product is required for compliance with interpretation with code compliance.
 - b. Product specified is unavailable.
 - c. Product proposed will provide a credit to the Owner.
 - 1) Contractor shall provide amount of proposed savings on the substitution request form.
 - d. Product proposed will provide a substantial benefit to the Owner's schedule.
 - 1) Contractor shall clearly delineate the positive impact to the project schedule.
 - e. Product supplier contractor default.
 - 1) Written documentation will be required to substantiate request.
 - 2. Substitution request including all required documentation must be delivered to the Architect's office no later than fifteen (15) calendar days after execution of the Contract.
 - 3. Reimbursement of Architect's costs
 - a. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by him and by his consultants in evaluation of each such proposed substitution.
 - b. Whether or not the Architect approves a proposed substitution, the Contractor promptly upon receipt of the Architect's billing shall reimburse the Architect at the rate of two and one-half times the direct cost to the Architect and his consultants for all time spent by them in evaluating the proposed substitution.

3.02 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Proposed product substitution shall comply with all applicable codes. Products not conforming to codes shall be removed and replaced at Contractors expense.
- B. Coordination of substitutions:
 - 1. Prior to each product substitution, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
 3. By submitting the substitution request form with each submittal, the contractor certifies that this coordination has been performed.
 - C. Substitutions:
 1. The Contract is based on the standards of quality established in the Contract Documents.
 2. Products specified by reference to standard specifications such as ASTM and similar standards do not require further approval.
 3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this Work by the Architect.
 - D. Coordination of Materials and Installation
 1. General contractor shall install all fire protection, electrical and data wiring in conduit as high as possible and above mechanical ductwork. General contractor shall install all fire protection, electrical, data, and wiring in conduit in areas designated on the plans while coordinating structure, mechanical equipment/ductwork, lighting, building controls, and architectural systems. The proposed layout of these systems and conduit shall be reviewed with and accepted by the architect prior to installation. Systems and conduit shall group in the area designated by the construction documents in an orderly and clean installation. Final locations and conditions of these systems and conduit shall only be accepted by the architect upon review after installation.
 - E. Miscellaneous Materials
 1. If proposed product substitution requires additional materials or accessories for installation in the project, Contractor shall be responsible for all costs.
 - F. Finishes
 1. Proposed product substitution shall not decrease the selection of colors or finishes.
 - G. Storage and Handling
 1. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.
 - H. Warranty
 1. Warranty of product shall not be less than that of specified product.
- 3.03 PRODUCT SUBSTITUTION REQUEST FORM**
- A. The Architect's "Substitution Request Form" must be used for each product submitted for consideration. The form is attached following this Section.
 - B. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.
 - C. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include side by side product comparisons, technical data, laboratory test results, product drawings, etc. References shall include three projects, which are from one to two years old, and three projects older than five years. Provide a list of references with the owners contact name and phone number.
 - D. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or project manual. Any cost differences resulting from modifications to the drawings and project manual and the cost of making the changes shall be borne by the Product Supplier.
 - E. Incomplete forms shall be rejected. The decision of the Architect is final.
- 3.04 OWNER-SUPPLIED PRODUCTS**
- A. Owner's Responsibilities:
 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.05 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged in manufacturer's original container with labels intact and legible.
 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
 2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- G. The Architect may reject as non-complying such material and products that do not bear identification and satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.
- H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.06 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions. Failure to comply will result in rejection of products for use on job.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.

- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- O. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.
- P. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION



MORE THAN ARCHITECTS

INSTRUCTIONS FOR USE OF SUBSTITUTION REQUEST FORM

STEPS

1. Substitution request **including all required documentation** must be emailed to the Project Leader at the Architects office no later than the date indicated in the specifications. Requests submitted late will not be considered. Contact information can be found on the Huckabee website bidding section under the specific project at: www.huckabee-inc.com/construction/
2. The Huckabee "Substitution Request Form" must be used for each project submitted for consideration.
3. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.
4. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include **side-by-side product comparisons**, technical data, laboratory test results, product drawings, etc. References shall include three projects which are from one to two years old, and three projects older than five years. Provide a list of references with the owner's contact name and telephone number.
5. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or specifications. Any cost differences resulting from modifications to the drawings and specifications and the cost of making the changes shall be borne by the Product Supplier.
6. **No** product will be considered "as equal" to the product specified until it has been included as an allowable substitution in a written Addendum to the project.
7. The decision of the Architect is final.

Huckabee



MORE THAN ARCHITECTS

SUBSTITUTION REQUEST FORM

Architect Project No: _____

Bid Date: _____

Date of Request: _____

Project Name: _____

SUBSTITUTION REQUEST BY:

Firm: _____

Address: _____

Phone: _____

Fax: _____

We hereby request that the following Substitution be allowed in lieu of the Product specified on the above project.

ARCHITECT / ENGINEERS RESPONSE:

☐ APPROVED

☐ APPROVED AS NOTED

☐ NOT APPROVED

☐ SUBMITTED TOO LATE

☐ FAILED TO PROVIDE ADEQUATE INFORMATION

REMARKS: _____

BY: _____ DATE: _____

SPECIFIED PRODUCT _____ SPECIFICATION SECTION _____

PROPOSED PRODUCT SUBSTITUTION _____

This request includes the following: attached Technical Data, Laboratory Tests and proposed changes to the Drawings and Specifications, which the proposed Substitution will require for proper installation.

The Firm requesting the Substitution agrees to pay for changes to the building design, including Architectural, Engineering, and detailing costs caused by the requested Substitution.

☐ YES

☐ NO

☐ NOT APPLICABLE

What effect does the Substitution have on other trades? _____

What effect does Substitution have on Construction Schedule? _____

Differences between proposed Substitution and specified item? _____

Manufacturer's guarantees of the proposed and specified items are: _____ Same _____ Different
(If different, explain on attachment)

The undersigned state that the function, appearance and quality are equivalent or superior to the specified item.

SIGNATURE

TITLE

DATE

Huckabee

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www.huckabee-inc.com

SECTION 01 6210
SCHEDULE OF MATERIALS AND COLORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Information and procedures for color submission for color schedule.
- B. Schedule of Materials and Colors for pre-selected colors.

1.02 RELATED SECTIONS

- A. Section 01 3000 – Administrative Requirements
- B. Section 01 6000 – Product Requirements

1.03 COLOR SCHEDULE PROCEDURES - PRE-BID SELECTED

- A. Contractor shall hold color samples requiring color selections until all are received. Only then shall the actual color samples be submitted to the Architect for selection. Colors samples matching color schedule shall not be submitted until field sample verifications are required.
 - 1. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
 - 2. The Contractor shall allow two (2) weeks after all colors are submitted for final Owner approval.

1.04 COLOR SCHEDULE PROCEDURES - POST-BID SELECTED

- A. Contractor shall hold all color samples until all items requiring color selections are received. Only then shall the actual color samples be submitted to the Architect for selection.
 - 1. Colors are noted on the drawings, and as specified. Where colors are not specified, Architect will select color with final color schedule.
 - 2. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
 - 3. The Contractor shall allow five (5) weeks after all colors are submitted for final Owner approval.

1.05 COLORS AND PATTERNS

- A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.
- B. Verify all graphics with the Architect before proceeding. Graphics may need to be adjusted to reflect the same composition as that shown on the drawings.

1.06 SUBMITTALS

- A. Field Samples
 - 1. Once colors are selected, and received at the job site and prior to application or installation, the Contractor shall submit one (1) sample of each item to the Architect for verification of color and pattern.
 - 2. The Contractor shall allow five (5) working days from date of receipt of submission for verification notification.

1.07 SCHEDULING

- A. Contractor shall submit all products in a timely manner to avoid project delays for long lead time items.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers listed or named in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements.

- B. The "listing" or "naming" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
- C. Products listed or named manufacturers proposed for use shall be comparable in all respects to specified make or model number designation of named products and shall meet or exceed specification requirements of type, function, color, and quality.
- D. Where products are specified by naming model number and manufacturers only, the named products establish a standard of quality. Refer to individual specification sections for additional manufacturers and procedures.

2.02 MATERIALS - GENERAL

- A. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
 - 2. Provide trim and accessories that match color and finish unless noted otherwise.
 - 3. Where contractor is submitting a substitution, contractor shall provide color equal to that specified. Substituted colors are not considered approved unless published in writing in Addendum prior to bid. If substituted product does not match specified color, contractor shall provide custom color as required at no additional cost to the owner.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Paint any vents, grilles, piping, columns, etc. the same color as the wall or graphic unless noted otherwise.
- B. Unless otherwise noted, all accent paint shall terminate at an inside corner. If wall terminates at storefront, wrap paint to meet edge of storefront.
- C. All exposed concrete shall be sealed.

3.02 SCHEDULE OF MATERIALS AND COLORS

- A. General Notes:
 - 1. All paint colors are subject to last shade adjustments.
 - 2. The Contractor shall submit samples of all finishes for comparison and approval of colors to the items listed in the color schedule.
 - 3. Where multiple buildings occur in one project, all materials and finishes may not apply to all buildings. Refer to the drawings for material and finish locations.
 - 4. The General Contractor shall verify all colors selections and numbers and note any drawings changes that may have occurred. Notify the Architect of any discrepancies found within 14 days.
 - 5. Notes stating "See Drawings for Locations" refer to the Construction Documents.
 - 6. Where note "pending submittal" occurs, Contractor shall submit samples of the material that meets the Standards outlined in the appropriate specification for Architect's review and selection. For materials with more than one color, texture or pattern available, Contractor shall submit the Manufacturer's full range of colors, texture and patterns.
 - 7. If there is a conflict between the product, material or color specified in this Legend and the product's specification Section within the Division, notify the Architect immediately. The Schedule of Materials and Colors shall govern unless a written clarification is given.
- B. See Schedule of Materials and Colors for specific product details and requirements as follows:

1776-06-01 Randall Hill Support Center

DIVISION 3 - CONCRETE

Concrete Finishing

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
COS	Concrete, Sealed				

DIVISION 5 - METALS

Metal Fabrications

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Metal Railings & Handrails			Stainless Steel	

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Roofing and Siding Panels

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
MP	Metal Wall Panels	MBCI		Pending Submittal; to be selected from Manuf. standard colors	

Flashing and Sheet Metal

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Metal 'R' Panel Roofing	MBCI		Pending Submittal; to be selected from Manuf. standard colors	
	Metal Flashing, Coving, & Trim	MBCI		Pending submittal	
	Gutters	MBCI		Pending submittal	
	Downspouts	MBCI		Pending submittal	

DIVISION 8 - OPENINGS

Doors and Frames

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Visible Door Hardware			Clear Anodized	
HM	Hollow Metal Doors & Frames			EPNT01	At Exterior Doors and Frames
	Coiling Doors & Grilles			Match EPNT01	
	Louvers				

DIVISION 9 - FINISHES

Resilient Flooring

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
BR01	Base, Rubber	Tarkett		40 Black	4" Cove Base

Painting and Coating

KEY	MATERIAL	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
PNT01	Paint	Sherwin Williams		SW7566 Westhighland White	At gyp walls
EPNT01	Epoxy Paint			To match adjacent metal panel	Exterior face HM & OH Doors
PNT03	Paint				
PNT04	Paint				

DIVISION 10 - SPECIALTIES**Information Specialties**

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Exterior Signage				
	Background			Pending Submittal; to be selected from Manuf. standard colors	
	Letters			BLACK	

Exterior Specialties

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Pre-Manufactured Canopies			Pending Submittal; to be selected from Manuf. standard colors	

DIVISION 13 - SPECIAL CONSTRUCTION**Metal Building**

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	COMMENTS
	Structural Steel			Painted, Match PNT01	

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.
- K. Administration of Warranty Phase.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 7800 - Project record documents, operation and maintenance data, certifications and inspections, warranties and bonds.
- F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- G. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural and load bearing members.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2019.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of 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.
 - 6. Include in request:
 - a. Identification of Project.

- b. Location and description of affected work.
- c. Necessity for cutting or alteration.
- d. Description of proposed work and products to be used.
- e. Effect on work of Owner
- f. Date and time work will be executed.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For surveying work, employ a land surveyor registered in Texas and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Texas. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Texas.

1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
 - 2. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.
- H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 - 1. Pest Control Service: Monthly treatments.
- I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

- J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- G. Prior to start of work, photo and/or video document all portions of the building.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, Contractor will convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section. Contractor, subcontractor, and manufacturer's representative shall be present.
- C. Notify Architect seven (7) days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review approved submittals.
 - 2. Review conditions of examination, preparation and installation procedures.
 - 3. Review coordination with related work.
 - 4. Installation schedule.
- E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.
- F. Pre-installation meeting shall not be scheduled until approved submittals are verified by the Contractor.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 NOTIFICATION OF ARCHITECT

- A. The Contractor shall notify the Architect a minimum of 48 hours prior to the covering up of any work in progress, in order for the architect to make proper field observations of the work in place. The Contractor shall place NO concrete, fill-in ditches, or cover up walls or ceilings without first contacting the Architect, as noted above and receiving approval.

3.07 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
 - 2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to Technology, Technology, Technology, Technology, Technology, and Technology): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment including those above acoustical lay-in ceilings and gypsum board/hard ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.08 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight at interior and weathertight at exterior to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.09 **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 this Work.
 - 3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
 - 4. Provide adequate storage for all items awaiting removal from the job 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 subparagraph A.1 above.
 - 3. Maintain the site in a neat and orderly condition at all times.
- C. Structures:
 - 1. Weekly, and more often if necessary, inspect the structures 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 structures 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. Damaged floors will be removed and replaced.
 - a. "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.

3.10 **PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.11 SYSTEM STARTUP

- A. Coordinate with General Commissioning Requirements per Mechanical Specifications.
- B. Coordinate schedule for start-up of various equipment and systems.
- C. Notify Architect and Owner 14 days prior to start-up of each item.
- D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- F. Verify that wiring and support components for equipment are complete and tested.
- G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.12 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.
- B. Refer to individual specification sections for more specific demonstration and training requirements.

3.13 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Division 23 for specific requirements.

3.14 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 provided by skilled cleaners using commercial quality building maintenance equipment and materials.
- B. The Contractor shall have initial cleaning complete prior to the Architect performing the "Punch List" walkthrough. The building shall be thoroughly (ready for occupancy) cleaned prior to the Owner acceptance (Substantial Completion) of the building.
- C. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in the Article above.
- D. Site:
 - 1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site. Powerwash paved surfaces, as required, to remove any stains caused by construction materials, vehicles, or workers, as approved by the Architect, and at no additional cost to the Owner.
 - 2. Completely remove resultant debris.
- E. Structures:
 - 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 the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
- 2. Interior:
 - a. Visually inspect all interior surfaces (floors, walls, ceilings, fixtures, furniture, appliances, and equipment) 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.
- F. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

3.15 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.

3.16 CLOSEOUT PROCEDURES

- A. Project Closeout
 - 1. No later than 60 days prior to Project Completion, as scheduled on the Contractors Critical Path Schedule, the Contractor shall:
 - a. Develop a Project Completion List for any and all tasks that remain along with a schedule for the completion of each. This list and schedule shall be written and delivered to the Owner and Architect.
 - b. Provide "hands-on" training to the Owner of all major systems as identified in Section 01 7800 – Closeout Submittals
- B. Substantial Completion
 - 1. Prior to requesting inspection by the Architect, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.
 - 2. No later than 30 days prior to the scheduled Substantial Completion date the Contractor shall call for a project walk through to determine if the project is substantially complete.
 - a. The Contractor shall prepare and submit a list of deficiency items as required by Paragraph 9.8.2 of the General Conditions. This list shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
 - b. The Contractor shall provide copies of the complete TAB (Commissioning) report and verification that all repairs have been made and that the systems are operational. This report and verification shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
 - c. The Contractor shall obtain the Certificate of Occupancy from the AHJ and supply a copy to the Architect a minimum of 7 days prior to the scheduled walk through and before substantial completion will be issued.
 - d. On the scheduled date of the walk through and after receipt of the deficiency list (punch list) the Architect will inspect the project to determine the status of completion.
 - e. Following inspection of the work, the Architect determines that the work is not substantially complete:
 - 1) The Architect promptly will so notify the Contractor, in writing, giving the reasons therefore.
 - 2) The Contractor shall remedy the deficiencies and notify the Architect when ready for re-inspection. The Architect will make only one trip to re-inspect the

- project.
- 3) The Architect shall be entitled to reimbursement of costs on an hourly basis for time spent to re-inspect the project. Rate for reimbursement shall be two hundred dollars per hour (\$200.00/hr) including travel time and shall be charged against the Contractors retainage held for this work.
- 3. When the Architect concurs that the Work is substantially complete:
 - a. The Architect will prepare a "Certificate of Substantial Completion" on AIA Form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified by the Architect.
 - b. The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.
- C. Final Completion
 - 1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.
 - 2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.8.2 of the General Conditions.
 - 3. Certify that:
 - a. Contract Documents have been reviewed;
 - b. Work has been inspected for compliance with the Contract Documents;
 - c. Work has been completed in accordance with the Contract Documents;
 - d. Equipment and systems have been tested as required, and are operational;
 - e. Work is completed and ready for final inspection.
 - 4. The Architect will make an inspection to verify status of completion.
 - 5. Should the Architect determine that the Work is incomplete or defective:
 - a. The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
 - b. Remedy the deficiencies promptly, and notify the Architect when ready for re-inspection.
 - 6. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.
- D. Closeout Submittals
 - 1. Closeout submittals as described in Section 01 7800 and Architect approval secured.
 - 2. Refer attached Check List.
 - 3. Contractor shall deliver all attic stock referenced in specifications. Attic stock shall be delivered to owners designated location. Contractor shall obtain a signed receipt of delivery.
 - 4. Contractor shall obtain Certificate of Occupancy from the AHJ and submit a copy to the Architect.
- E. Release of Funds
 - 1. Retainage for the project will be held until project closeout is complete as verified by the items in paragraph above and the attached Check List including the completion of all Punch List items.
 - 2. The Architect will estimate the cost of each item on the Punch List, withholding funds for each which shall be separate from the retainage. These funds will be released to the Contractor as items are completed and verified on the Punch List.
 - 3. THE RETAINAGE WILL NOT BE RELEASED UNTIL CERTIFICATE OF OCCUPANCY FROM THE AHJ HAS BEEN SUBMITTED TO THE ARCHITECT.
 - 4. THE RETAINAGE WILL NOT BE RELEASED UNTIL THE PROJECT CLOSEOUT IS COMPLETE.
- F. Final adjustment of accounts

1. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

FINAL ACCEPTANCE CHECKLIST

DATE: _____
PROJECT NAME: _____
OWNER'S NAME: _____
COMPLETED BY: _____
TO: _____
COPY TO: _____

THE FOLLOWING CHECKLIST IS COMPLETED AND THEREFORE THE PROJECT IS READY FOR FINAL PAYMENT AS OUTLINED IN THE CONTRACT DOCUMENTS.

Received Final Payment Request and Release of Claims.			
Final Change Order Completed and Signed By All.			
Contractor's Affidavit of Payment of Debts and Claims.			
Consent of Surety To Final Payment.			
All Operation & Maintenance Manuals Received.			
Final Record Drawings Received.			
All Guarantees and Warranties Received.			
Punchlist Fully Cleared (Attached Copy).			
Air Quality and Commissioning Completed and All Items Addressed and Corrected.			
Written Acknowledgement of Lead and Asbestos Free.			
All Attic Stock Delivered to Owner.			
Certificate of Occupancy Obtained From AHJ			

EXPLANATION OF ANY OUTSTANDING ISSUES OR DEFICIENCIES: _____

HEREBY SUBMITTED FOR REVIEW:

SIGNED: _____ **DATE:** _____

3.17 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
 - 1. Review warranty request procedures with the Architect and Owner no less than two weeks prior to Date of Substantial Completion.
 - 2. All work performed and completed during the Contractor's one year warranty period shall be noted as complete and signed off on accordingly on a warranty request form as agreed upon by Owner and Architect. The form will be provided to the Contractor for each item requested for maintenance or repair and is required to be returned, once the work is complete, in the same originally sent document format with cause and corrective action described in detail. All work during the Contractor's one year warranty period shall be communicated by the Contractor to both the Owner and Architect.
 - 3. Contractor shall maintain a complete and accurate schedule of the dates of Substantial Completion, dates upon which the one year warranty on each phase or building which is substantially complete will expire, and dates of Final Completion. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one month prior to the expiration of the one year warranty period on each building or each phase of the building, which has been substantially completed. Prior to termination of the one year warranty period, Contractor shall accompany the Owner and Architect on review of the building and be responsible for correcting any reasonable deficiencies not caused by the Owner or by the use of the building which are observed or reported during the review. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within three (3) days of initial notification from Owner. Contractor shall prosecute the work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

**SECTION 01 7800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures.
- B. Project Record Documents.
- C. Operation and Maintenance Data.
- D. Warranties and bonds.
- E. Closeout Documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Section 01 7900 - Demonstration and Training: Training requirements.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.
- F. Individual Product Sections: Specific requirements for demonstration and training.

1.03 SUBMITTALS

- A. Submittal Procedure
 - 1. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".
 - 2. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.
 - 3. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.
 - 4. Within sixty (60) calendar days of substantial completion, Contractor shall submit closeout submittals as required in accordance with this section and secure Architect's approval.
 - 5. Contractor shall provide cover page with space for Contractor and Architect review stamps for each submission.
 - 6. The Architect's approval of the current status of Project Record Documents may be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under the Contract.
 - 7. Prior to submitting each request for progress payment, secure the Architect's approval of the current status of the Project Record Documents.
 - 8. Prior to submitting request for final payment, Contractor shall submit the final Project Record Documents to the Architect and secure his approval.
 - 9. Contractor shall submit a complete set of closeout documents for each project where multiple projects are combined under a single proposal package.
 - 10. Review and Final Submission of Closeout Submittals
 - a. Participate in review meetings as required.
 - b. Documents shall be reviewed and verified by contractor prior to submission to the Architect.
 - c. Review submittal with Owner and Architect prior to final submittal for review and electronic archiving and document reproduction.

- d. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
(Example - 1234-01-01 Tiling 09 3000 - 5)
When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number. On re-submittals, cite the original submittal number for reference.
 - e. Contractor shall allow 14 days from date of submission for Preliminary Architectural Review excluding delivery time to and from the Contractor.
 - f. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
 - g. Submittals received by Architect without General Contractor's stamp will be rejected.
 - h. Make changes required from the Preliminary Architectural Review and deliver the Final Project Record Documents to and secure approval from the Architect. When revised for resubmission, identify all changes made since previous submission.
 - i. Contractor shall allow 21 days from date of submission Final Project Record Documents for document reproduction.
 - j. Contractor will coordinate electronic archiving and document reproduction of the final closeout submittal with Owner's designated company.
 - k. Contractor will pay all associated cost in preparing close-out documents and pay cost of final closeout submittal digital archiving and document reproduction. Should Owner forgo hard copies, Contractor shall submit a credit to the Owner.
11. Closeout Submittals Requirements.
- a. Closeout and Record Documents as required by this section shall be provided to the Owner upon completion of the project. Submit the number as outlined below:
 - 1) Project Record Documents - Drawings and Project Manual
 - (a) One (1) original hard copy
 - (b) One (1) copy on USB Flash Drive
 - 2) Closeout Documents – Including Operation and Maintenance Manuals
 - (a) One (1) original hard copy
 - (b) One (1) copy on USB Flash Drive
 - b. Electronic Submittal Format.
 - 1) The digital file shall be set up using a non-proprietary "PDF" format.
 - 2) All data shall be indexed/book marked.
 - 3) Data shall be searchable by key word. All data shall allow printing of material.
 - 4) Electronic submittal and hard copies shall follow the format shown in Part 3.
 - 5) Under 3.05,J, all items shall be organized as specified.
 - c. Training Session Submittal Format.
 - 1) Refer to Section 01 7900 - Demonstration and Training.
- B. Project Record Documents: Submit documents to and secure approval from Architect prior to request for final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. RFIs.
 - 5. Change Orders and other modifications to the Contract.
 - 6. Reviewed shop drawings, product data, and samples.

7. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
 1. Record Documents may be recorded digitally or hard copy.
 2. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
 3. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
 - a. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
 - b. In such case, provide replacements to the standards originally required by the Contract Documents.
- D. Identify each of the documents with the title, "RECORD DOCUMENTS - JOB SET".
- E. Record information concurrent with construction progress. Record Documents shall be current and submitted with each pay application.
- F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Prior to construction, affix or insert all addenda to the record documents, both drawings and specifications. Neatly mark all areas modified.
 2. Making entries on Drawings.
 - a. Using colored markings, clearly describe the change by graphic line and note as required.
 - b. Date all entries.
 - c. Call attention to the entry by a "cloud" drawn around the area or areas affected. Add delta triangle with the letters "RD" inside the triangle.
 - d. In the event of overlapping changes, use different colors for the overlapping changes.
 3. In addition to field changes, neatly mark the record documents with areas modified by RFIs and change orders.
 4. Schematic layouts.
 - a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and is not intended to portray precise physical layout.
 - b. Clearly identify the item by accurate note such as "cast iron drain," "copper water", and the like.
 - 1) Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum," "exposed," and the like).
 - 2) Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
 5. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 6. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 7. Field changes of dimension and detail.
 8. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. 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.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning 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 information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. Refer to Divisions 21, 22, 23, 26, 27 and 28 for system requirements.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable hard plastic covers; 4 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings by volumes. Staples are not allowed.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties organized by division with project scopes listed for each company.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Contents: Prepare final project record closeout documents for delivery to Owner as follows:

1. FILE FOLDER: XXXX-XX OWNER'S NAME - PROJECT NAME - CLOSEOUT SUBMITTAL
 - a. FILE FOLDER: 01 Table of Contents
 - 1) PDF File: Table of Contents
 - b. FILE FOLDER: 02 Project Directory
 - 1) PDF File: Project Directory (organized as below):
 - (a) Design Team
 - (b) General Contractor
 - (c) Sub-Contractors and Principal Vendors (organized by Division with project scope(s) listed for each Company)
 - c. FILE FOLDER: 03 Contract Forms (organized and titled as below):
 - 1) PDF FILE: Substantial Completion, AIA G704
 - 2) PDF FILE: Payment and Performance Bond
 - 3) PDF FILE: Certificates of Liability Insurance
 - 4) PDF FILE: Contractor's Affidavit of Payment of Debts and Claims, AIA G706
 - 5) PDF FILE: Contractor's Affidavit of Release of Liens, AIA G706A
 - 6) PDF FILE: Consent of Surety to Final Payment, AIA G707
 - 7) PDF FILE: Contractor and Sub-contractors' Release or Waiver of Liens
 - 8) FILE FOLDER: Change Orders
 - (a) PDF FILES: (separate files for each Change Order, organized and titled in numerical order)
 - d. FILE FOLDER: 04 Certifications and Inspections (organized and titled as below):
 - 1) 1) PDF FILE: The correspondence from the Geotechnical Engineer, required by Section 01 1400 at the beginning of construction, indicating that the Construction Documents conform with their recommendations.
 - 2) PDF FILE: The correspondence from the Special Inspection and Testing Agency (SITA), required by Section 01 1400 at the beginning of construction, indicating that the SITA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
 - 3) PDF FILE: The correspondence from the Commissioning Agent (CxA), required by Section 01 1400 at the beginning of construction, indicating that the CxA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
 - 4) PDF FILE: The "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control" required by Section 01 4533 at the beginning of construction.
 - 5) PDF FILE: A copy of the written correspondence from the Contractor to the AHJ submitting the "Final Reports of Quality Control" required by Section 01 4533 from the SITA, CxA, and Code-Required Structural Observer. The copy of this correspondence shall include the actual reports and not just be a cover letter.
 - 6) (a) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the SITA
 - 7) (b) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the CxA
 - 8) (c) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Code-Required Structural Observer
 - 9) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Structural Engineer
 - 10) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Mechanical Engineer

- 11) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Electrical Engineer
- 12) PDF FILE: Certificates of Occupancy
- 13) PDF FILE: TEA Certificate of Project Compliance
- 14) PDF FILE: Final Fire Inspection
- 15) PDF FILE: Final Health Inspection
- 16) PDF FILE: Final Elevator Inspection
- 17) PDF FILE: Final Building Inspection
- 18) PDF FILE: ADA Inspection Report
- 19) PDF FILE: Energy Code Compliance Letter
- 20) PDF FILE: HVAC Test and Balance Reports
- 21) PDF FILE: Backflow Test Report
- 22) PDF FILE: Data Testing Results
- 23) FLW FILE: Data Testing Results (Native)
- e. FILE FOLDER: 05 Health/Safe Environment Data (organized and titled as below):
 - 1) PDF FILE: Asbestos-, Lead- and Hazardous-Free Material Certificates (organized by Division)
 - 2) PDF FILE: Material Safety Data Sheets (MSDS) (organized by Division)
 - 3) PDF FILE: Indoor Air Quality Test Reports
- f. FILE FOLDER: 06 Additional Project Information
 - 1) FILE FOLDER: Requests for Information
 - (a) PDF FILES (separate files for each RFI, organized and titled in numerical order)
 - 2) FILE FOLDER: Requests for Proposals
 - (a) PDF FILES (separate files for each RFP, organized and titled in numerical order)
 - 3) FILE FOLDER: Approved Submittals
 - (a) PDF FILES (separate files for each Submittal, organized and titled in numerical order by specification section)
- g. FILE FOLDER: 07 Attic Stock
 - 1) PDF FILES: Attic Stock Sign-Off Sheets (separate files for each, showing Owner receipt, and organized and titled in numerical order by Specification Section)
- h. FILE FOLDER: 08 Demonstration and Training
 - 1) FILE FOLDER: Sign-In Sheets
 - (a) PDF FILES: (separate files for each, organized and titled in numerical order by Specification Section)
 - 2) FILE FOLDER: Training Videos
 - (a) All training videos organized and titled in numerical order by Specification Section
- i. FILE FOLDER: 09 Project Record Documents
 - 1) PDF FILE: Project Record Specifications Manual (organized and bookmarked by Division and by Specification Section) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".
 - 2) PDF FILE: Project Record As-Built Drawings (organized and bookmarked by Sheet Number) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".
- j. FILE FOLDER: 10 Warranties
 - 1) FILE FOLDERS: (separate file folders, organized and titled by Division)
 - (a) PDF FILES: (all warranty PDF files organized under each Division file folder and titled by Company Name)

- (b) PDF FILE: List of all warranties extending past one year. Include company name and contact information.
- k. FILE FOLDER: 11 Operation and Maintenance Manuals
 - 1) PDF FILE: Keying Schedule
 - 2) PDF FILE: Shop Drawings (separate files for each, organized and titled by Specification Section)
 - 3) FILE FOLDER: Manuals
 - (a) FILE FOLDERS: (separate file folders, organized and titled by Division)
 - (b) PDF FILES: (all Manuals PDF files organized under each Division file folder and titled by Specification Section and scope)

3.06 CHANGES SUBSEQUENT TO ACCEPTANCE

- A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and requiring routine maintenance where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment, including Geothermal Well systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Conveying systems.
 - 6. Landscape irrigation.
 - 7. Audio and Visual systems.
 - 8. Lighting systems.
 - 9. Security systems and Access Controls.
 - 10. Fire Alarm systems.
 - 11. Kitchen Equipment.
 - 12. Resinous Flooring
 - 13. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Architect and Midlothian ISD.
 - 2. Submittals indicated as "Draft" are intended for the use of Owner in preparation of overall Training Plan; submit in editable electronic format, latest version of Microsoft Word required.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit not less than four weeks prior to start of training.
 - 2. Revise and resubmit until acceptable.
 - 3. Provide an overall schedule showing all training sessions.
 - 4. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such a slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 - 4. Include Midlothian ISD's formal acceptance of training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.
 - 3. Provide sign-off sheets in the closeout documents indicating the individuals who were in attendance at each of the training sessions.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Midlothian ISD.
- D. Provide training in minimum two hour segments.

- E. The Midlothian ISD is responsible for determining that the training was satisfactorily completed.
- F. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- G. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- H. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- I. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.
- J. Contractor must have written approval from the Owner and Architect to forgo any required trainings.

END OF SECTION

SECTION 02 4113

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 1100 – Summary of Work: Instructions concerning hazardous materials
2. Section 01 5000 – Temporary Facilities and Controls
3. Section 01 7700 – 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 3216 – CONSTRUCTION PROGRESS SCHEDULES.
- B. Submit record documents under provisions of SECTION 01 7700 – 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 or locations identified on plans. 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 03 1000
CONCRETE FORMING AND ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete.
- B. Form accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- D. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).
- E. PS 1 - Structural Plywood 2009.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with relevant portions of ACI 301, ACI 301, and ACI 301.

2.02 WOOD FORM MATERIALS

- A. Wood forms for unexposed concrete surfaces - No. 2 Common Southern Yellow Pine Lumber or other material of equal qualifications of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces.
- B. Wood forms for exposed concrete surfaces - Commercial Standard Douglas Fir, moisture-resistant, concrete form plywood with one smooth face.

2.03 PREFABRICATED CARTON VOID FORMS

- A. Manufacturers:
 - 1. SureVoid Products, Inc: www.surevoid.com.
 - 2. Substitutions: As approved by the Engineer.
- B. Carton Void Forms
 - 1. Function: used to create a space directly under structural concrete slab. Capable of sustaining all vertical and lateral loads applied until loads can be supported by concrete structure.
 - 2. Composition: corrugated paper material with a moisture resistant exterior, and having an interior fabrication of a uniform, cellular configuration, composed of non-wax impregnated

- biodegradable components.
- 3. Depth: As indicated on the Structural Drawings.
- 4. Profile: rectangular shape in cross-section.
- 5. Strength: capable of sustaining a working load of 1000 psf.
- 6. Accessories: of same composition and strengths as slab void forms.
- C. Protective Cover Board: 1/8" thick masonite with no sheets overlapping and chairs at edges to stabilize.
- D. Expandable Foam: Expandable spray foam shall be installed at all gaps in the void form system, but shall not prohibit proper concrete cover around rebar.

2.04 FORMWORK ACCESSORIES

- A. Formwork shall consist of steel or wood forming where it is required to form concrete, except under gradebeams and slabs where carton void forms are shown on the construction drawings. Where carton void forms are shown, it is acceptable to either use carton void forms or use temporary steel or wood forming that is to be removed. If steel or wood forming is used where carton void forms are shown on the construction drawings, a void space shall be created below the concrete to match the specified carton void form dimensions.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Composition: Colorless mineral oil-based compound.
- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- D. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch .
- E. Soil Retainers: Shall be provided where specified and shown on the drawings to prevent migration of backfill under suspended foundation elements.
- F. Retainers shall be composed of high density polyethylene materials that are not adversely affected by moisture. They must be flexible, impact resistant and have sufficient strength to resist lateral loads applied by soil.
 - 1. Soil retainers shall extend 3 inches above the void forms and a minimum of 3 inches below the void forms. To allow for construction tolerances, the height of the soil retainer material ordered shall be at least 10 inches greater than the specified void depth. Soil retainers shall not be attached to concrete. Waler ties shall be twisted off to allow soil retainers to rise the specified void depth.
 - 2. Use 3/8" thickness for void spaces 8" and less. Use 1/2" thickness for void spaces greater than 8" but less than 12". Use 3/4" thickness for void spaces equal to 12". Soil retainers shall be equal to the following:
 - a. BackFill Retainer by SureVoid Products, Inc. (installing this product vertically as recommended by the manufacturer)
 - b. Substitutions: See section 01 6000 - Product Requirements.
 - 3. For void spaces greater than 12" but less than or equal to 16", retainers shall be ribbed and made from high density polyethylene. Soil retainers shall be equal to the following:
 - a. Motzblock by M&M Construction specialties (installing this product at an angle as recommended by the manufacturer)
 - b. SureRetainer by VoidForm Products, Inc. (installing this product at an angle as recommended by the manufacturer)
 - c. Substitutions: See section 01 6000 - Product Requirements.
- G. Waterstops: See section 03 3000 - Cast-in-Place Concrete.
- H. Expanded Polystyrene (EPS) Geofoam:

1. Lightweight expanded polystyrene with a minimum compressive strength of 2.2 pounds per square inch (psi) at a 1% deformation.
2. Geofoam shall be in compliance with ASTM D 6817.
3. Geofoam shall be shaped to provide continuous support for raised slabs or to act as a lightweight fill material at locations indicated on the drawings.
4. Manufacturers:
 - a. Foam-Control EPS Geofoam, AFM Corporation: www.geofoam.com
 - b. InsulFoam GF, Insulfoam, LLC.: www.insulfoam.com
 - c. Therma Foam: www.thermafoam.com

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. Earth formed grade beams allowed only where noted in the Structural Drawings. Grade beams shall be FORMED ON ALL structural slabs and exposed conditions. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Refer to the Civil Drawings for construction joint requirements at flatwork.
- E. Construction joints for Structural concrete: Contractor shall obtain written approval for all construction joints not shown on Drawings for structural concrete. The Contractor shall locate construction joints in grade beams as shown on the Structural Drawings, with keyways and continuous reinforcement through the joint. The Contractor shall not be permitted to install a construction joint in any structurally suspended slabs unless less the joint is located over a grade beam providing a minimum of 4 inches of bearing on each side of the grade beam and unless the Architect approves of the location, which generally is acceptable if the joint is primarily located at least 1 inch under a wall. Slab construction joints shall not have a keyway and shall have continuous slab reinforcement running through the joint.
 1. If the Contractor desires to reduce the size of a slab pour, the Contractor shall be required to, at no additional cost to the Owner, install concrete shoring grade beams along the proposed construction joint. The grade beam shall be a minimum of 14 inches wide and minimum 24 inches deep with 3 #8 top and bottom and #3 stirrups at 10 inches on center. The grade beam shall be supported by deep foundation elements which the Contractor lowers as required to accommodate the new grade beam or by new deep foundation elements installed solely to support the CJ grade beam so that the grade beam is supported by deep foundation elements, using the Typical DFE Detail, at a maximum of 15 feet on center, (although additional deep foundation elements would not likely be required).
- F. Construction joints: Locate construction joints in concrete as indicated. Contractor shall obtain written approval for all construction joints not shown on Drawings for structural concrete. Distance between construction joints shall be arranged so that the greatest horizontal dimension (including diagonal measurement) for slab pours shall not exceed 200 feet. Provide keyways and extra dowels at all joints. Provide longitudinal keys at joints.

- G. Expansion joints: Expansion joints shall consist of joint fillers with sealant. Install filler strips 3/4" below finished surfaces. Clean grooves when surface is dry of foreign matter, loose particles and concrete protrusions; then fill approximately flush with joint sealant to be slightly concave after drying. Finish edges of exposed concrete along expansion joints around all fixed objects within or abutting concrete.
- H. Void spaces:
 - 1. Contractor shall be solely responsible for providing void spaces of full size and extent shown on the drawings and install in accordance with manufacturer's recommendations.
 - 2. An 1/8" thick masonite sheet shall be placed on the void forms and below vapor barrier. Sheets shall be butted against each other, not overlapped, and all sheet corners shall be stapled to the void forms under the masonite.
 - 3. Void forms shall remain dry and undamaged prior to concrete placement. Damaged pieces shall be replaced prior to concrete pour.
 - 4. The void forms shall be placed in the largest pieces practical while adequately securing in place. All joints and exposed ends shall be sealed to prevent leakage of concrete into the void space.
 - 5. Contractor shall provide evidence satisfactory to the structural engineer that proper void spaces have been provided.
- I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.06 FIELD QUALITY CONTROL

- A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- C. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.07 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- C. ACI SP-66 - ACI Detailing Manual 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2016.
- F. CRSI (DA4) - Manual of Standard Practice 2009.
- G. CRSI (P1) - Placing Reinforcing Bars 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, location of splices and embedded metal assemblies.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 318, ACI 318, ACI 301, ACI 318, and ACI 318.
 - 1. Maintain one copy of each document on project site.
- B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.
- C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
 - 3. Splicing of pier reinforcement shall not be permitted.
- B. Weldable Reinforcing Steel: ASTM A 706, deformed low-alloy steel bars.
 - 1. Unfinished.
- C. Steel Welded Wire Reinforcement (WWR): Plain type; Plain type;
 - 1. Form: Flat Sheets.
- D. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. At slabs, supports shall not be further than 48

inches apart, each way.

3. Provide plastic or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI SP-66 - ACI Detailing Manual.
- B. Welding of reinforcement is not permitted, unless explicitly indicated on Structural Drawings
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 1. Review locations of splices with Architect.
 2. Approved patented type splices (No Electric Arc Welding Permitted) may be used instead of lap splices.
 3. Any bar may be field bent one time without notifying the Structural Engineer, unless noted otherwise on the Structural Drawings. Reinforcement smaller than #4 bars shall be cold bent. Reinforcement greater than #4 bars shall be bent with heat in the field. Heating shall be controlled by temperature indicating crayons and shall reach a maximum temperature of 1500 degrees Fahrenheit. Reinforcement shall not be artificially cooled until temperature has reduced naturally to below 600 degrees Fahrenheit. Bends shall be gradual and care shall be taken to prevent heating or cracking of concrete. If reinforcement must be field bent more than once, the Contractor shall issue an RFI indicating which bars need to be field bent additionally.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Placement of reinforcing steel shall be done in cooperation with requirements of other trades. No cutting of reinforcement or displacement of bars shall be done by any of the trades without the consent of the Architect, and then only when adequate reinforcement is provided to replace the design requirements.
- E. Use templates to locate all column and footing dowels.
- F. Maintain concrete cover around reinforcing as indicated on drawings.
- G. Bond and ground all reinforcement to requirements of Section 26 0526.

3.02 FIELD QUALITY CONTROL

- A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete building frame members.
- B. Concrete for composite floor construction.
- C. Elevated concrete slabs.
- D. Floors and slabs on grade.
- E. Concrete Floor Topping and Feathering Material.
- F. Joint devices associated with concrete work.
- G. Miscellaneous concrete elements, including equipment pads, light pole bases, and flagpole bases.
- H. Concrete curing.

1.02 COORDINATION OF CIVIL AND STRUCTURAL CONCRETE SPECIFICATIONS

- A. This specification section applies to all concrete designs provided on the Structural Drawings. For clarification, this specification section applies to interior and exterior concrete designs provided on the Structural Drawings (possibly including but not limited to sidewalks, patios, pavement, ramps, stairs, retaining walls, etc.). For exterior concrete designs not shown on the Structural Drawings but shown on the Civil Drawings, the provisions of this specification section only applies when there is not a conflicting specification elsewhere in the Project Manual or Civil Drawings.

1.03 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.

1.04 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete 2016.
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting 2010.
- F. ACI 306R - Guide to Cold Weather Concreting 2016.
- G. ACI 308R - Guide to External Curing of Concrete 2016.
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- I. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2020.
- L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2020.
- M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2015a.
- N. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- Q. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.
- R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019.

- S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.
- T. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.
- U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.
- V. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover 2008a, with Editorial Revision (2013).
- W. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.
- Y. ASTM F 1249
- Z. COE CRD-C 48 - Method of Test for Water Permeability of Concrete 1992.
- AA. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop 1974.
- BB. NSF 61 - Drinking Water System Components - Health Effects 2019.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. The Contractor shall submit all proposed mix designs to the Architect for review before use. Each mix design shall clearly identify where the Contractor proposes use, such as indicating "Drilled Piers", "Auger Cast-In-Place Piles", "Concrete Columns", "Insulating Concrete Formed Walls", "Cast-In-Place Concrete Retaining Walls", "Precast Tilt Wall Panels", "Light Pole Bases", "Grade Beams", "Interior Slabs on Grade & Interior Slabs on Metal Deck", "Interior Slabs on Void Boxes and Interior Slabs on Temporary Formwork", "Exterior Slabs on Grade, Exterior Slabs on Metal Deck and Miscellaneous Concrete", "Exterior Slabs on Void Boxes and Exterior Slabs on Temporary Formwork", "Storm Shelter Roof Topping Slab", "Greenhouse Foundations", "Freezer Slabs & Cooler Slabs", "Crawlspace Mudslab", etc. Failure to clearly identify where mixes are proposed for use is a suitable reason for rejection. To expedite approval it is suggested that all mix designs related to Structural items be submitted separately from all mix designs related to Civil items as these two categories are reviewed by different parties. Furthermore, to expedite approval, it shall be permitted to email Structural Mix Designs directly to the Structural Engineer or Record and request approval.
- C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, refer to Submission requirements below before products shall be permitted and provide letters of acceptance from the flooring subcontractor and provide data on method of removal in the event of incompatibility with floor covering adhesives.
 - 2. For vapor barriers, submit all of the following:
 - a. Product data and installation instructions.
 - b. Documentation from the manufacturer or patent-holder indicating that:
 - 1) The product is a minimum 15 mil product;
 - 2) The product is suitable for installation in contact with soil or granular fill under concrete slabs;
 - 3) Where a concrete-adhering tape is specified for use (e.g. over voidforms), both the vapor barrier product manufacturer or patent-holder and the concrete-adhering tape manufacturer or patent-holder have indicated that the concrete-adhering tape is compatible with the submitted vapor barrier product, and that test data indicates the tape will adhere to the concrete with a minimum 12 pounds per linear inch of tape.
 - c. Documentation from an independent agency indicating that:

- 1) The independent agency is a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder;
 - 2) The independent agency randomly selected the samples for testing from one or more warehouses (or other distribution locations) and then shipped the samples to one or more testing laboratories;
 - 3) Testing was completed within four years before construction proposals are due for this project, by one or more independent testing laboratories;
 - 4) The testing fully complied with ASTM E 1745 or identifying any deviations from ASTM E 1745 (including deviations from any documents referenced by ASTM E 1745), with permeance testing having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E 154 Sections 8, 11, 12 and 13);
 - 5) The puncture, tensile strength and permeance results of the testing comply with the requirements for a 15 mil, Class A vapor barrier according to ASTM E 1745; and,
 - 6) The average permeance of all samples tested for each of the five permeance testing scenarios is less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F 1249 or ASTM E 96 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13.
- D. Samples: Submit samples of underslab vapor barrier and tape to be used if making a substitution request.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.06 **QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 **FORMWORK**

- A. Comply with requirements of Section 03 1000.

2.02 **REINFORCEMENT MATERIALS**

- A. Comply with requirements of Section 03 2000.

2.03 **CONCRETE MATERIALS**

- A. Cement: ASTM C150 or ASTM C 1157, Type I/II Portland type.
 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33.
 1. Acquire aggregates for entire project from same source.
 2. Fine aggregate:
 - a. Provide washed natural or manufactured sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.
 3. Coarse aggregate:

- a. Provide coarse aggregate consisting of clean, hard, fine grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.
- b. Use coarse aggregate of the largest practicable size for each condition of placement, subject to the following maximum size limitations:
 - 1) Do not exceed 3/4 of the clear distance between reinforcing bars, 1/5 of the narrowest dimension between sides of forms, or 1/3 the depth of any slab section.
- c. For each slab mix design submittal (excluding pavement designed by the Civil Engineer and shown on the Civil Drawings): The concrete supplier shall provide a combined (coarse and fine) sieve analysis for the proposed aggregate blend, using sieve data measured within the past 3 months. It shall be permitted for the concrete supplier to submit a combined sieve analysis that is calculated based on individual sieve analyses. The combined sieve analysis shall show the percent retained on each sieve (not the cumulative percent retained) and shall meet the following requirements:
 - 1) Sizes: 1", 3/4", 1/2", 3/8", #4, #8, #16, #30, #50, #100.
 - 2) No sized other than those listed shall be on the analysis.
 - 3) 0% to 5% shall be retained on the top (largest) size.
 - 4) 1.5% to 5% shall be retained on the #100 sieve.
 - 5) 2% to 20% shall be retained on all intermediate sieves.
 - 6) The percent retained on each intermediate sieve shall not be greater than 1.2 times the percent retained on any adjacent intermediate sieve.
 - 7) If the percent retained requirements above cannot be met by using multiple aggregate piles from the plant, the Contractor shall assume for bidding purposes that outside sources will be required.
 - 8) Requests for variances are permitted to be submitted to the Engineer for consideration.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Fly Ash: ASTM C618 C or F
- E. Water: ASTM C94/C94M or potable.
- F. Concrete Floor Topping and Feathering Material:
 - 1. At feathered locations, provide cement-based self-leveling underlayment.
 - 2. Provide manufacturer's recommended primer for standard absorbent concrete.
 - 3. Aggregate shall be well graded, washed gravel (1/8" to 1/4" or larger) for use when underlayment is installed over 1 1/2" thick.
 - 4. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).
 - 5. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
 - a. Ardex Engineered Cements, 400 Ardex Park Drive; Aliquippa, PA; (724) 203-5000; www.ardex.com .
 - b. (Level-Right) Maxxon Corporation, 920 Hamel Road, Hamel, MN; (763) 478-9600; www.level-right.com .
 - c. Bonsal American, 8201 Arrowridge Blvd., Charlotte, NC 28224, (800) 738-1621; www.bonsal.com .
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

- B. Dispense in compliance with manufacturer's recommendations with particular attention to possible undesirable chemical reaction between products when mixed in concentrated form.
- C. Air Entrainment Admixture: ASTM C260/C260M.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
 - 1. Manufacturers:
 - a. MasterGlenium 1466 by BASF Corporation.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Mid-Range Water Reducing Admixture: Complying with ASTM C494/C494M Type A and/or Type F and having a maximum of 25% lignosulfonates.
 - 1. Manufacturers:
 - a. POLYHEED 1020 by Degussa Admixtures
 - b. SIKAMENT 686 by Sika (214) 878-3669
 - c. PLASTOL 341 by Euclid Chemical Co. (216) 531-9222
 - d. POZZOLITH 200N by BASF Corporation
 - e. MasterGlenium 1466 by BASF Corporation
 - f. Substitutions: See Section 01 6000 - Product Requirements. A letter from the manufacturer will be required indicating that the material does not have more than 25% lignosulfonates.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Barrier shall meet all of the following requirements:
 - 1. The product shall be a minimum 15 mil product.
 - 2. The product shall be suitable for installation in contact with soil or granular fill under concrete slabs according to the manufacturer or patent-holder.
 - 3. Within four years before construction proposals are due for this project, an independent agency (a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder) shall have randomly selected the samples for testing from one or more warehouses (or other distribution locations) and then shipped the samples to one or more testing laboratories which then completed testing in compliance with ASTM E 1745 having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E 154 Sections 8, 11, 12 and 13), with the puncture, tensile strength and permeance results of the testing complying with the requirements for a 15 mil, Class A vapor barrier according to ASTM E 1745, and the average permeance of all samples tested for each of the five permeance testing scenarios being less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F 1249 or ASTM E 96 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13.
 - 4. Accessory Products: At slabs on grade and over the subgrade of all crawlspaces, install vapor barrier manufacturer's recommended tape for sealing seams and penetrations in vapor barrier. At slabs poured over carton void forms, install the vapor barrier over the Masonite and tape all joints (and tape the perimeter of the vapor barrier under the slab area) with a concrete-adhering tape that bonds to the concrete with a minimum tensile strength of 12 pounds per linear inch. A letter or other documentation from the manufacturer or patent-holder of the vapor barrier and the manufacturer or patent-holder of any concrete-adhering tape required for this project shall be submitted to the Architect indicating that both products are compatible. At all areas where vapor barrier is installed, install the vapor barrier manufacturer's recommended adhesive, mastic, prefabricated boots, etc.
 - 5. Manufacturers and/or Patent-Holders:

- a. **** NOTE TO SPEC WRITER: Stego's testing is valid until March 2018 and Poly-America's testing is valid until July 2021**
- b. Stego Industries, LLC: www.stegoindustries.com. (Stego 15 mil - Class A)
- c. Poly-America: www.poly-america.com (Yellow-Guard 15 mil - Class A)
- d. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
- C. Waterstops: Self-sealing, non-swelling preformed joint sealant.
 - 1. Single component, self-sealing adhesive compound, extruded in a square cross-section between two quick-release protective wrappers.
 - 2. Meets Federal Specification SSS-210
 - 3. Certified NSF/ANSI Standard 61 for use in potable water systems
 - 4. Manufacturers:
 - a. Henry Company; Synko-Flex Waterstop: www.us.henry.com
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Reglets: See Section 03 1000 - Concrete Forming and Accessories
- E. Joint Filler: See Section 03 1000 - Concrete Forming and Accessories
- F. Slab Construction Joint Devices: See Section 03 1000 - Concrete Forming and Accessories

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
 - 1. Manufacturers:
 - a. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
- B. At all building slabs, except locations where a "sealer" is shown on the Architectural Drawings: Wet Curing with Potable Water that is not detrimental to concrete.
 - 1. Unless otherwise approved as a substitution request, Proposers shall assume for Proposal purposes that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested as a substitution request, the Architect may elect to permit this material at certain locations if the Contractor verifies that the warranty will be met: Curing Compound, Naturally Dissipating, Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309. Note: Many flooring installer Subcontractors will no longer warranty flooring if any kind of curing compound is used! It is the Contractor's responsibility for verifying compatibility of flooring materials and adhesives with any proposed curing compound before proposing curing compounds.
- C. At all building slabs where a "sealer" is shown on the Architectural Drawings: Curing and Sealing Compound, Semi-Gloss: Liquid, membrane-forming, dries clear, non-yellowing acrylic-based polymer; complying with ASTM C1315 Type 1 Class A.
 - 1. Vehicle: Solvent-based.
 - 2. Solids by Mass: 25 percent, minimum.
 - 3. VOC Content: Ozone Transport Commission (OTC) compliant.
 - 4. Manufacturers:
 - a. BASF; MasterKure CC 250 SB: www.master-builders-solutions.basf.us
 - b. W.R. Meadows, Inc.; CS-309-25 OTC: www.wrmeadows.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.08 CONCRETE MIX DESIGN REQUIREMENTS

- A. Note to Building Official: The specified air contents for this project are based on the interpretation that all concrete on this project is under Exposure Category F0 conditions in which Freezing and Thawing concerns are "Not Applicable". The International Building Code requires that air contents of concrete be within ranges specified by ACI 318 for various Exposure Categories depending on the probability of exposure to moisture before freezing, and probability of cycles of freezing and thawing. ACI Commentary describes F0 as concrete that will not be exposed to cycles of freezing; F1, exposed to cycles of freezing and thawing that will be occasionally exposed to moisture before freezing; F2, exposed to cycles of freezing and thawing that is in continuous contact with moisture before freezing; and F3, similar to F2 with exposure to deicing chemicals. The "not applicable" interpretation for this project is based on the very limited number of freeze thaw cycles that are likely to occur at this project and based on the consideration that high air contents can cause problems such as cracking and surface delamination.
- B. Refer to the schedule of mixes at the end of this specification section for requirements specific to different applications. It shall be permitted to submit to the Engineer any desired proprietary designs which deviate from the schedule of mixes if and only if all deviations from the schedule are clearly noted and if test data is provided indicating the performance of the concrete with regard to slump versus time, strength versus time, and air content.
- C. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- D. Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301. It shall be an obligation of the Contractor to produce and deposit concrete that will exceed specified strength twenty-eight days after placing. Concrete falling below specified strength required by ACI 318, as shown by cylinder test shall be removed by the Contractor and be replaced with concrete at specified strength at no cost to the Owner unless otherwise approved by the Engineer after evaluation.
- E. Concrete may be proportioned and mixed at the job, dry-batched and mixed at the job or be procured from a ready-mixed concrete plant. Whatever the method of production, concrete materials and concrete shall be stored handled and mixed in conformance with all requirements of ASTM C94, which apply to the particular method selected.
- F. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- G. Aggregate: As specified in Section 2.03 B.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements Section 03 1000 - Concrete Forming and Accessories.
- B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
 - 3. At intersections of pours for concrete walls and beams (including foundation elements such as grade beams), install a 1 1/2" deep keyway that is a minimum of 1/3 the thickness and 1/3 the height (unless otherwise noted) and roughen the exposed surface of the first pour with a minimum 1/4" amplitude.
- C. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions.

Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

- D. Vapor Barrier: At exterior floor slabs where indicated on the Structural Drawings Sheets and Notes and at all interior floor slabs, a vapor barrier under the floor slab shall be installed in accordance with ASTM E 1643 and as indicated in Part 2 of this Specification Section. Lap joints minimum 6 inches. Repair damaged vapor retarder before covering.
 - 1. Install compactible granular fill before placing vapor barrier at areas where slabs are poured on grade. Install void boxes and masonite before placing vapor barrier at areas where slabs are to be poured on void boxes. Do not place sand between the vapor barrier and the slab.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of Section 03 2000 - Concrete Reinforcing.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 48 hours prior to commencement of placement operations.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- E. Separate slabs on grade from vertical surfaces with joint filler as indicated on drawings.
- F. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- G. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 9005 for finish joint sealer requirements.
- H. Install joint devices in accordance with manufacturer's instructions.
- I. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- J. Install joint device anchors for expansion joint assemblies specified in Section 07 9513. Maintain correct position to allow joint cover to be flush with floor and wall finish.
- K. Apply sealants in joint devices in accordance with Section 07 9005.
- L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- M. Place concrete continuously between predetermined expansion, control, and construction joints.
- N. Deposit concrete continuously or in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within sections.
- O. Do not interrupt successive placement; do not permit cold joints to occur.
- P. Placing of concrete in supported elements shall not be started until concrete previously placed in columns and walls is no longer plastic.
- Q. Consolidate concrete by vibration, spading or rodding, so that concrete is thoroughly worked around reinforcement, around embedded items and into corners or forms, eliminating all air or

stone pockets that may cause honeycombing, pitting or planes or weakness.

- R. Place floor slabs-on-grade in saw cut pattern indicated.
- S. Saw cut slab-on-grade joints within 24 hours after placing. Use 3/16 inch thick blade, cut into slab 1/4 depth of slab thickness.
- T. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.06 **SEPARATE FLOOR TOPPINGS**

- A. Prior to placing floor topping, roughen substrate concrete surface and, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.
- E. Place concrete floor toppings to required lines and levels.
 - 1. Place topping in checkerboard panels not to exceed 20 feet in either direction.
- F. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.07 **FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3. Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.08 **CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as indicated on drawings and as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
 - 2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 3. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
 - 4. Broom Finish: Ramps, stair treads, sidewalks, porches and docks, concrete pads and bases for mechanical equipment. Steel trowel smooth. Brush after troweling with a soft bristle broom to create non skid surfaces perpendicular to the direction of travel.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.09 **CURING AND PROTECTION**

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If use of such materials is desired by the Contractor, the Contractor shall either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction. Unless otherwise approved as a substitution request, the Contractor shall assume during bidding that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested by the Contractor as a substitution request or during construction, the Architect may elect to permit this material at certain locations. Generally, the Architect will require a letter from the flooring subcontractor guaranteeing that the curing compound is compatible with the flooring adhesive and flooring materials.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
 - b. Spraying: Spray water over floor slab areas and maintain wet.
 - c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3.10 FIELD QUALITY CONTROL

- A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

3.11 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.13 SCHEDULE - CONCRETE MIX DESIGN REQUIREMENTS

- A. "Drilled Pier" Mix: 3,000 psi 28 day concrete, 6" to 8" slump, 1.5% +/- 1.5% air content, air entraining agent not required, minimum 5 sacks of cement per cubic yard, up to 20% replacement using Class C or F fly ash permitted, mid or high range water reducing agents permitted.
- B. "Light Pole Bases" Mix: 3,000 psi 28 day concrete, 6" to 8" slump, 4.5% +/- 1.5% air content using air entraining agent as required, minimum 5 sacks of cement per cubic yard, fly ash not permitted for any elements which are part of a building system (e.g. exterior columns), up to 20% replacement of cement with Class C or Class F fly ash permitted for other site elements

such as light pole bases, mid range and high range water reducing agents permitted.

- C. "Grade Beam" Mix: 3,000 psi 28 day concrete, 4" to 6" slump, 4.5% +/- 1.5% air content using air entraining agent as required, minimum 5 sacks of cement per cubic yard, up to 20% replacement of cement with Class C or Class F fly ash permitted. Mid range water reducing agents permitted, high range water reducing agents permitted.
- D. "Interior Slabs on Grade" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.5, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 1.5% +/- 1.5% air content, air entraining agent not permitted, minimum 5 sacks of cement per cubic yard with up to 20% replacement using Class F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply. If any portion of concrete is will be permanently in contact with exterior elements, Miscellaneous Concrete mix design shall apply.
- E. "Exterior Slabs on Grade and Miscellaneous Concrete" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.50, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 4.0% +/- 1.5% total air content using air entraining agent, minimum 5 sacks of cement per cubic yard, up to 20% cement replacement using Class F fly ash permitted, Class C fly ash not permitted unless it also qualifies as a Class F fly ash, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Railing and guardrail assemblies.
- B. Wall-mounted handrails.
- C. Free-standing railings at steps.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- D. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing 2016.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2009 (Reapproved 2015).
- G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2013, with Editorial Revision.
- H. AWS C3.4M/C3.4 - Specification for Torch Brazing 2016.
- I. AWS C3.5M/C3.5 - Specification for Induction Brazing 2016 (Amended 2017).
- J. AWS C3.9M/C3.9 - Specification for Resistance Brazing 2009.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).
- L. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
 - 1. Contractor.
 - 2. Manufacturer's representative.
 - 3. Architect.
 - 4. Other subcontractors of adjacent work.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- D. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- E. Manufacturer's Installation Instructions.
- F. Maintenance Data: Manufacturer's instructions for care and cleaning.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing decorative stairs and railing systems and acceptable to manufacturer.
- B. Templates: Supply installation templates, reinforcing and required anchorage devices.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory provided protective coverings and packaging.

- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.

1.07 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.
- B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.08 WARRANTY

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Decorative Metal Railings:
 - 1. C. R. Laurence Co., Inc: www.crl-arch.com.
 - 2. HDI Railing Systems: www.handrail-design.com.
 - 3. Hoffa Inc.: www.hoffainc.com
 - 4. Hollaender Manufacturing Co: www.hollaender.com.
 - 5. Livers Bronze Co.: www.liversbronze.com
 - 6. VIVA Railings: www.vivarailings.com.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAILING SYSTEMS

- A. Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
 - 1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
 - b. Distributed Load: 50 lb/ft minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
 - c. Concentrated Loads on Intermediate Rails: 50 psf, minimum.
 - d. Concentrated Load: 200 lbs minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
 - e. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
 - 3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
 - 4. Field Connections: Provide sleeves to accommodate site assembly and installation.
 - 5. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - a. Ease exposed edges to small uniform radius.
 - b. Welded Joints:
 - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
 - 2) Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
 - c. Brass/Bronze Brazed Joints:

- 1) Perform torch brazing in accordance with AWS C3.4M/C3.4.
 - 2) Perform induction brazing in accordance with AWS C 3.5/C 3.5M.
 - 3) Perform resistance brazing in accordance with AWS C 3.9/C 3.9M.
- B. Metal Tube Railing: Engineered, post supported railing system with metal infill.
1. Configuration: Guardrail with separate handrail.
 2. Top Rail: 2 inch diameter pipe or tube.
 3. Grip Rail: Round, stainless steel, 1-1/2 inch diameter.
 4. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
 5. Wall Mounted Components: Components necessary to support railing with 1-1/2 inch clearance from wall, and as follows:
 - a. Underslung support brackets: Supports at 60 inches, maximum.
 - b. Wall return without support: Terminates 1/4 inch from side wall.
 6. Handrail Brackets: Same metal as railing.
 7. Fasteners: Concealed.
 8. Infill at Picket Railings: Vertical pickets
 - a. Horizontal Spacing: Maximum 4 inches on center.
 - b. Material: Solid steel bar.
 - c. Size: 1/2 inch diameter.
 9. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded.
- C. Wall-Mounted Handrail:
1. 1-1/2 inch diameter stainless steel; No. 6 satin finish..
 2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
 3. Handrail Brackets: Manufacturer's standard stainless steel brackets.
 - a. Mounting: Wall.
 - b. Finish: No. 6 satin finish..
 4. Comply with TAS and ADA Standards.

2.03 MATERIALS

- A. Stainless Steel Components:
1. ASTM A666, Type 316.
 2. Stainless Steel Tubing: ASTM A554, Type 316, 16 gage, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.
 3. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 316.
 4. Stainless Steel Finish: No. 6 satin finish..

2.04 ACCESSORIES

- A. Non-Weld Mechanical Fittings for Stainless Steel Railings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- C. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
 2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
 3. For anchorage to stud walls, provide backing plates for bolting anchors.

- 4. Exposed Fasteners: No exposed bolts or screws.
- D. Carbon Steel Bolts and Nuts: ASTM A307.
- E. Sealant: Silicone; clear.
- F. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections and abraded areas.
 - 4. Touch up shop primer and factory applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- F. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

3.06 CLEANING

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.
- C. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

3.07 PROTECTION

- A. Protect installed components and finishes from damage after installation.

- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

**SECTION 06 1000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Sheathing.
- D. Roofing nailers.
- E. Roofing cant strips.
- F. Preservative treated wood materials.
- G. Fire retardant treated wood materials.
- H. Miscellaneous framing and sheathing.
- I. Concealed wood blocking, nailers, and supports.
- J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

1.03 REFERENCE STANDARDS

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2017.
- D. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.
- G. PS 1 - Structural Plywood 2009.
- H. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.
- I. PS 20 - American Softwood Lumber Standard 2015.
- J. SPIB (GR) - Grading Rules 2014.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on vendor, vendor, vendor, and vendor.
- C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- D. Samples: For rough carpentry members that will be exposed to view, submit three samples, 12by12 inch in size illustrating wood grain, color, and general appearance.
- E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
 - 2. Identify plywood sheathing as to grade, use, span rating and exposure classification by the mark of the APA The Engineered Wood Association.

3. Use extreme care when off-loading lumber to prevent damage, splitting and breaking of materials. Split or broken plywood sheathing will not be accepted for use in the work of this Section.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: 19 percent maximum.
- D. Stud Framing (2 by 2 through 2 by 6):
 1. Species: Any allowed under referenced grading rules.
 2. Grade: No. 2.
- E. Joist and Rafter Framing (2 by 6 through 4 by 16):
 1. Species: Spruce-Pine-Fir (South).
 2. Grade: No. 2.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: No. 2 or Standard Grade.

2.03 STRUCTURAL COMPOSITE LUMBER

- A. System Description
 1. Design Requirements: Design gate system to withstand Miami/Dade County 110 MPH steady wind and 130 MPH gusting wind tests.
- B. Warranties
 1. Furnish manufacturer's 25-year warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites and fungal decay of composite wood.
- C. Materials
 1. Composite Wood:
 - a. Reclaimed wood and plastic with integral coloring; free from toxic chemicals and preservatives.
- D. Components
 1. Gate System: as detailed on the drawings.
 - a. Components:
 - 1) Pickets
 - 2) Top and bottom rails.
 - 3) Bottom rail inserts.
 - b. Surface texture: Smooth.
 - c. Color: as selected by Architect.
- E. Accessories
 1. Fasteners: Galvanized or corrosion-resistant coated steel.
- F. Manufacturers:

1. Trex Company: www.trex.com
2. iLevel by Weyerhaeuser: www.ilevel.com.
3. Boise Cascade: www.bc.com.
4. Georgia-Pacific Corp.: www.gp.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

- G. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.04 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: S-dry (19 percent maximum).
- C. Surfacing: S4S.
- D. Species: Douglas Fir.
- E. Grade: No. 2, 2 Common, or Construction.

2.05 CONSTRUCTION PANELS

- A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
 1. Bond Classification: Exposure 1.
 2. Span Rating: 40/20.
 3. Thickness: 5/8 inch, nominal for standing seam metal roofs, 2 layers of 3/8 inch, nominal for curved standing seam metal roofs and 3/4 inch for asphalt shingle roofs.
 4. Within 40 feet in any direction of any 4-hour firewall, install fire-retardant treated plywood sheathing.
 5. Provide metal clip supports between sheets
- B. Other Applications: Thickness as noted on the drawings
 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 3. Other Locations: PS 1, C-D Plugged or better.

2.06 ACCESSORIES

- A. Fasteners and Anchors:
 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Water-Resistive Barrier: As specified in Section 07 2500.

2.07 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with

AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWP U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWP U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: {\rs\#1}, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber in other locations as indicated.
2. Preservative Pressure Treatment of Plywood Above Grade: {\rs\#1}, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.
 - d. Treat plywood in other locations as indicated.
3. Preservative Pressure Treatment of Lumber in Contact with Soil: {\rs\#1}, Use Category UC4A, Commodity Specification A using waterborne preservative to 0.40 lb/cu ft retention.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
 - b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 **FRAMING INSTALLATION**

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWI (WFCM) Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 **BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.05 **ROOF-RELATED CARPENTRY**

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 **INSTALLATION OF CONSTRUCTION PANELS**

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions of above-referenced guide.
- B. Comply with system manufacturer's written instructions for installing plywood.
 - 1. Install plywood sheathing continuously, with the strength of the axis of the panel across supports. Plywood sheathing shall be installed with offset joints. Butt end joints over supports, providing a space of 1/16" at panel ends and 1/8" at panel edges.
 - 2. Fasten each layer of plywood sheathing using #13-14 Dekfast screws with Phillips drive truss heads in a noncorrosive base material in sufficient length to penetrate the metal decking by 1/2". Use a screw pattern of 6" spacing along exterior edges and a 12" interior grid pattern per UL90 class 580 uplift. Provide a minimum of 32 fasteners per sheet. Plywood shall be fastened as an independent system for the insulation. Where drawings indicate multiple layers of plywood, stagger second layer in both directions from pattern below. At curved roof structures, plywood shall conform to the radius of the structure.
 - 3. Within 40 feet in any direction of any 4-hour firewall, install fire-retardant treated plywood sheathing.
 - 4. Provide metal clip supports between sheets at center spans unless tongue and groove plywood sheathing is used.
 - 5. Cover plywood sheathing as soon as possible with specified underlayment for protection against excessive moisture prior to roofing application.
 - 6. Do not install plywood sheathing in adverse weather conditions. Plywood sheathing may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, crook, mildew, fungus, or mold as well as for improper curing and firming prior to installation. Wet or damaged plywood sheathing will be rejected.

3.07 **SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3.08 **TOLERANCES**

- A. Framing Members: 1/8 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 3/8 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 **CLEANING**

- A. Waste Disposal: Comply with the requirements of Section 01 7000.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 07 9005
JOINT SEALERS**

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work included:
 - 1. Scope - All labor, materials and equipment to provide the joint sealants shown on drawings and as described in this specification.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 – Quality Requirements
- B. Section 03 3000 – Cast-In-Place Concrete

1.03 REFERENCE STANDARDS

- A. ASTM C 920 (Latest Edition) Elastomeric Joint Sealants

1.04 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who have successfully completed a minimum of 3 projects in the last 5 years of similar type and scope as the project herein. The workmen shall be thoroughly trained and experienced in joint sealant applications and completely familiar with the specified requirements and methods needed for the proper performance of the work of this section.
- B. Joint sealer products shall be obtained from a single manufacturer for each product required.
- C. Job site testing;
 - 1. All joint sealants shall be field tested for proper adhesion to the joint substrates prior to installation. Do not proceed with the work until job site tests have been approved by the Architect.
 - 2. Locate and provide test joints for each type of joint sealant, and substrate as directed by the Architect.
 - 3. Acceptable test joints will be used as the standard for all joint sealant work on the project.
 - a. Sealants which fail to adhere to the substrates shall be removed and replaced at no extra cost to the Owner.

1.05 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 3000 – Administrative Requirements.
- B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- C. Samples: Accompanying the submittal described above, submit Samples of each sealant, each backstop material, each primer, and each bond breaker proposed to be used. Include color samples of full standard product color range.
- D. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
 - 1. All mastics, glues, and adhesives
 - 2. Sealant (interior use only)

1.06 ENVIRONMENTAL CONDITIONS

- A. The ambient temperature shall be within the limits of 4 and 38 degrees C 40 and 100 degrees F when sealant is applied.

1.07 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

- B. Do not retain at the job site material which has exceeded the shelf life recommended by its manufacturer.
- C. Store products on site in compliance with the manufacturer's recommendations and as necessary to prevent damage or deterioration to the materials.
- D. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 38 degrees C 100 F degrees or less than 4 degrees C 0 degrees F.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. GE Silicones: www.siliconeforbuilding.com
- B. MasterSeal: www.master-builders-solutions.basf.us/en-us.
- C. Pecora; www.pecora.com.
- D. Tremco; www.tremcoroofing.com.
- E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SEALANTS

- A. Use elastomeric Sealants (ASTM C 920) for interior and exterior applications.
- B. Chemically curing sealants should not be used adjacent to or above membrane surfaces of asphaltic or bituminous materials; a sealant based on asphalt or bituminous materials similar to those in the membrane should be used.
- C. Applicable type, grade, class, and use for each intended purpose is outlined below:
 - 1. Type S: Single-component
 - 2. Type M: Multicomponent
 - 3. Grade P: Pourable or self-leveling sealant for horizontal applications
 - 4. Grade NS: Nonsag for vertical applications
 - 5. Class 25: Withstands increase and decrease of at least 25 percent of joint width
 - 6. Class 12.5: Withstands increase and decrease of at least 12.5 percent of joint width
 - 7. Use T: Pedestrian and vehicular traffic areas such as walkways, plazas, decks, and parking garages
 - 8. Use NT: Non traffic areas, horizontal and vertical surfaces
 - 9. Use M: Meets this specification when tested on mortar
 - 10. Use G: Meets this specification when tested on glass
 - 11. Use A: Meets this specification when tested on aluminum
 - 12. Use O: Meets this specification when tested on substrates other than above.
- D. Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

2.03 INTERIOR SEALANT

- A. Provide interior sealant in accordance to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Color as selected by architect. Location(s) of sealant shall be as follows:
- B. LOCATION
 - 1. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.
 - 2. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.
 - 3. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.
 - 4. Joints between edge members for acoustical tile and adjoining vertical surfaces.
 - 5. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.
 - 6. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where non-planer tile surfaces meet.

7. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
8. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.
9. At expansion joint locations between wall and floor as detailed on the drawings provide Pecora Urexpan NR 200.

2.04 EXTERIOR SEALANT

- A. For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. Color as selected by architect. Location(s) of sealant shall be as follows:
- B. Location
 1. Joints and recesses formed where frames (Match adjacent and subsills of windows, doors, louvers, surface color) and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.
 2. Joints between new and existing exterior masonry walls.
 3. Masonry joints where shelf angles occur.
 4. Joints in wash surfaces of stonework.
 5. Expansion and control joints.
 6. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.
 7. Voids where items pass through exterior walls.
 8. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.
 9. Metal-to-metal joints where sealant is indicated or specified.
 10. Joints between ends of gravel stops, fascias, copings, and adjacent walls.
 11. Joints at thru wall flashing.
 12. Joints between concrete columns and CMU.

2.05 FLOOR JOINT SEALANT

- A. For Floor Joint Sealant provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. Color as selected by architect. Location(s) of sealant shall be as follows:
- B. LOCATION
 1. Seats of metal thresholds for exterior doors.
 2. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

2.06 PRIMERS

- A. Use only those primers which are non-staining, have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used.

2.07 BACKSTOP MATERIALS

- A. Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Backstop material shall be compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.08 BOND-PREVENTATIVE MATERIALS

- A. Use only one of the following as best suited for the application, and as recommended by the manufacturer of the sealant used:
 1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials as indicated;
 2. Aluminum foil complying with MIL-A-148E;
 3. Wax paper complying with Fed Spec UU-P-270.

2.09 MASKING TAPE

- A. For masking around joints, provide masking tape complying with Fed Spec UU-T-106c.

2.10 CLEANING SOLVENTS

- A. Provide type(s) recommended by the sealant manufacturer, except for aluminum and bronze surfaces that will be in contact with sealant.

2.11 WARRANTY

- A. All sealants and caulking shall be provided with a 5 year manufacturer's warranty.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Concrete and ceramic tile surfaces:
 - 1. Install only on surfaces which are dry, sound, and well brushed, wiping free from dust.
 - 2. At open joints, remove dust by mechanically blown compressed air if so required.
 - 3. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
 - 4. Where surfaces have been treated, remove the surface treatment by sandblasting or wire brushing.
 - 5. Remove laitance and mortar from joint cavities.
 - 6. Where backstop is required, insert the approved backup material into the joint cavity to the depth needed.
- B. Steel surfaces:
 - 1. Steel surfaces in contact with sealant:
 - a. Sandblast as required to achieve acceptable surface for bond.
 - b. If sandblasting is not practical, or would damage adjacent finish, scrape the metal or wire brush to remove mill scale.
 - c. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
 - 2. Remove protective coatings on steel by sandblasting or by using a solvent which leaves no residue.
- C. Aluminum surfaces:
 - 1. Aluminum surfaces in contact with sealant:
 - a. Remove temporary protective coatings, dirt, oil, and grease.
 - b. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.
 - 2. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are non-staining.

3.03 INSTALLATION OF BACKSTOP MATERIAL

- A. Use only the backup material recommended by the manufacturer of the sealant used, and approved by the Architect for the particular installation, compressing the backup material 25% to 50% to achieve a positive and secure fit.
- B. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

3.04 PRIMING

- A. Use only the primer recommended by the manufacturer of the sealant, and approved by the Architect for the particular installation, applying in strict accordance with the manufacturer's recommendations as approved by the Architect.

3.05 BOND-BREAKER INSTALLATION

- A. Provide an approved bond-breaker where recommended by the manufacturer of the sealant for preventing the sealant to adhering to rigid, inflexible joint filler materials or to joint surfaces at back of joint where such adhesion would result in sealant failure. Adhere strictly to the installation recommendations as approved by the Architect.

3.06 JOINT WIDTH-TO-DEPTH RATIOS

- A. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- B. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding shall not be required on metal surfaces.

3.07 INSTALLATION OF SEALANTS

- A. Color shall be selected from on-site samples as selected by the Architect.
- B. Prior to start of installation in each joint, verify the joint type according to details on the Drawings, or as otherwise directed by the Architect, and verify that the required proportion of width of joint to depth of joint has been secured.
- C. Comply with ASTM C1193 for application of joint sealants.
- D. Equipment
 - 1. Apply sealant under pressure with power-actuated or hand gun, or by other appropriate means.
 - 2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.
- E. Thoroughly and completely mask joints where the appearance of sealant on adjacent surfaces would be objectionable.
- F. Install the sealant in strict accordance with the manufacturer's recommendations as approved by the Architect, thoroughly filling joints to the recommended depth.
- G. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings.
- H. Do not install sealant when air temperature is under 40 deg. F. Sealant temperature to be at least 50 deg. F.; controlled warming permitted to ease installation.
- I. Cleaning up
 - 1. Remove masking tape immediately after joints have been tooled.
 - 2. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Hollow metal borrowed lites glazing frames.
- E. Accessories, including glazing, louvers, matching panels, and removable stops and astragals.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

- A. 2012 TAS - Texas Accessibility Standards 2012.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.
- G. ASTM A1011/A1011M - 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 2018a.
- H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- L. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
 - 1. All mastics, glues, and adhesives

2. Thermal insulation (excluding fiberglass, foam, rubber)
3. Sealant (interior use only)
4. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 1. Black Mountain Door, LLC., Amweld Brand: blackmountaindoor.com.
 2. Ceco Door; or Curries, an Assa Abloy Group company: www.assaabloydss.com.
 3. Deansteel Manufacturing, Inc.: www.deansteel.com.
 4. Rocky Mountain Metals, Inc.: www.rockymountainmetals.com.
 5. Steelcraft, an Allegion brand: www.allegion.com/sle.
 6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 2. Accessibility: Comply with ICC A117.1, 2012 TAS and ADA Standards.
 3. Typical Door Face Sheets: Flush.
 4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 6. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
- D. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns and miters

neatly welded and all weld beads ground smooth for finishing.

- E. Doors at exterior locations shall be manufactured of A60 galvanized or G60 hot dipped galvanized steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns, and miters neatly welded and all weld beads ground smooth for finishing. All exterior doors shall seal tightly and not allow insect pests easy access to the buildings.
- F. Face sheets of 16 gauge steel reinforced and sound-deadened by 22 gauge formed steel vertical stiffeners spaced not less than 6" o.c. and attached to face sheets by spot welds not less than 5" o.c. Vertical stiffeners at exterior door locations shall be galvanized or hot dip galvanized. Voids between vertical stiffeners shall be filled with fiberglass batting.
- G. Top and bottom edges closed with continuous recessed steel channels, of not less than 16 gauge, spot welded to both faces. Top edge of exterior doors sealed flush with welded in place closing channel to exclude water.
- H. Overlapping steel astragals for pairs of labeled doors as required by manufacturer to meet codes.
- I. Doors and frames are to be prepared to receive mortise type hardware and at hinge, lock, latch, and all other hardware locations, reinforcing plates shall be spot welded to the inner surface of the jambs. Hinge reinforcements shall not be less than 7 gauge steel. All top hinge reinforcements to incorporate manufacturer's optional high frequency hinge reinforcement or full jamb depth hinge reinforcement. All other hardware reinforcements shall be not less than 12 gauge steel. Where door closers or brackets are to be installed, reinforcing plates shall be not less than 12 gauge steel. Twenty-four gauge galvanized steel plaster guards are to be spot welded over the hardware reinforcing plates. Provide 12 gauge reinforcement, for full height of door leaf, welded inside throat of frame to door rabbet wherever continuous geared hinges are scheduled. Provide 1/2" polystyrene, Celotex, or similar material, adhesive attached to the continuous hinge reinforcement inside the throat of the frame wherever continuous geared hinges are scheduled. Necessary holes for field installation of mortise type hardware shall be drilled and tapped from templates, which are to be furnished to the frame manufacturer by the hardware contractor. Provide suitable reinforcements for surface applied hardware, but no drilling or tapping is to be done at the factory for application of surface applied hardware. Prepare frames for silencers.
- J. All glazing trim shall either be an integral part of the door face on the secure side with a removable bead flush with the opposite door face or metal glass light trim with a projection not to exceed 3/32" from either door face,

2.03 FULL AND TWO-LIGHT DOORS

- A. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.
- B. Doors at exterior locations shall be manufactured of A60 galvanized or G60 hot dipped galvanized steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.
- C. Face sheets of 16 gauge steel. Voids in tubular members shall be filled with fiberglass batting.
- D. Vertical stiles, top rail, and intermediate rail (if detailed) shall be of 6" nominal construction. Tubular construction of top rail shall provide a flush top surface to exclude water and moisture. Bottom rail shall be of 12" nominal construction.

2.04 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Core Material: Vertical steel stiffeners with fiberglass batts.
 - 2. Door Thickness: 1-3/4 inch, nominal.

3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
4. Thickness: 1-3/4 inches.
5. Weatherstripping: Refer to Section 08 7100.
- B. Interior Doors, Non-Fire Rated:
 1. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 2. Door Thickness: 1-3/4 inch, nominal.
- C. Fire-Rated Doors:
 1. Fire Rating: As indicated on drawings, tested in accordance with UL 10C ("positive pressure").
 - a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
 - b. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD).
 - c. Attach fire rating label to each fire rated unit.
 2. Core Material: Mineral board.
 3. Door Thickness: 1-3/4 inch, nominal.

2.05 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 3. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.
 4. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 14 gage, 0.067 inch or 16 gage, 0.053 inch, minimum.
 2. Three-sided frames for single doors up to and including 4'-0" in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6'-0" and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 14 gage, 0.067 inch or 16 gage, 0.053 inch, minimum.
 3. Three-sided frames for single doors up to and including 4'-0" in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6'-0" and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.
- E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- F. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
 1. All two-piece mullions shall be factory welded to form a single-piece, inseparable section before assembly into a frame unit.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Transom Bars: Fixed, of profile same as jamb and head.

2.06 ACCESSORIES

- A. Louvers: Roll formed steel with concealed frame; finish same as door components ; factory-installed.
 - 1. Style: Standard straight slat blade.
 - 2. Fasteners: Exposed tamper proof fasteners.
- B. Glazing: As specified in Section 08 8000.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered corners; prepared for countersink style tamper proof screws.
- D. Astragals for Double Doors: Specified in Section 08 7100.
- E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- F. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- G. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions. Omit silencers on exterior doors.
- H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- I. For each jamb in masonry construction, provide 3 or more 16 gauge adjustable jamb anchors of the T-anchor type or of the wire masonry anchor type spaced not more than 30" apart.
- J. For each jamb in steel stud construction, provide 3 or more 18 gauge drywall type jamb anchors.

2.07 FINISHES

- A. All doors and frames shall be cleaned free from scale, rust or rough spots; shall be bonderized and shall receive one shop coat of, light gray, rust inhibitive primer before shipment. All touch-up on finished field painting shall be done by the painting contractor.
- B. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, air dried.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.
- D. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Where practicable, place frames prior to construction of enclosing walls and ceilings.
- D. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.
- E. Coordinate frame anchor placement with wall construction.
- F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- G. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
- H. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide "Z" fillers at each screw location.

- I. Fit and hang doors to maintain specified clearances. Metal hinge shims are acceptable to maintain clearances.
- J. Coordinate installation of hardware.
- K. Coordinate installation of glazing.
- L. Coordinate installation of electrical connections to electrical hardware items.
- M. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touch-up of compatible air-drying primer.
- N. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 08 3300
COILING DOORS AND GRILLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes, but is not limited to:
 - 1. Electrically operated interior/exterior overhead coiling doors.
 - 2. Electrically operated overhead coiling counter shutters.
 - 3. Operators, controls and accessories for all models.
- C. Related Sections:
 - 1. Section 01 1400 - Work Restrictions
 - 2. Section 05 5000 – Metal Fabrications
 - 3. Section 08 7100 – Door Hardware
 - 4. Division 26 – Electrical connections and Fire Alarm
- D. Products Installed but not Supplied Under this Section:
 - 1. Install cylinders furnished under Section 08 7100 – Door Hardware.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.03 SUBMITTALS

- A. Shop drawings, product data, and samples under provisions of Section 01 3000 – Administrative Requirements.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings:
 - 1. Provide drawings indicating guide details, head and jamb conditions, clearances, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
- D. Samples:
 - 1. Submit color samples of pre-finished doors.
- E. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7800 - Closeout Submittals.
 - 2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
 - a. All mastics, glues, and adhesives
 - b. Sealant (interior use only)
 - c. Fire doors (insulating material)
 - 3. Maintenance Data: Include manufacturer's data for maintenance and resetting.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Single Source Responsibility:
 - a. Obtain each type of door required from single source.
 - 2. Installer Qualifications:
 - a. Specializing in coiling doors having minimum of five (5) years successful documented experience with work comparable to that required for this Project.
- B. Regulatory Requirements and Approvals:
 - 1. Listed by Underwriters Laboratories (UL)
- C. Pre-installation Meetings
 - 1. Comply with provisions of Section 01 3000 – Administrative Requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 – Product Requirements.
- B. Packing, Shipping, Handling, and Unloading
 - 1. Comply with manufacturer's ordering instructions and lead - time requirements to avoid construction delays.
 - 2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection
 - 1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.06 WARRANTY

- A. Comply with requirements of Section 01 7800 – Closeout Submittals.
- B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace doors that fail in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
 - 1. Raynor Door: www.raynor.com.
 - 2. McKeon Rolling Steel Door Co., Inc.: www.mckeondoor.com.
 - 3. The Cookson Company: www.cooksondoor.com.
 - 4. Overhead Door Corp.: www.overheaddoor.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING DOORS

- A. Acceptable Product: Raynor - Duracoil Standard
- B. Door Operators
 - 1. Provide doors designed for jackshaft motor operation. Reference drawings for motor orientation.
- C. Requirements
 - 1. Type: Belt drive control hoist
 - 2. Motor Horsepower Rating: Continuous 1/2 HP.
 - 3. Electrical Requirements: 115 volt single phase.
 - 4. Duty Cycle: 30 cycles/hour.
 - 5. Control Wiring: 24 volt control with provisions for connection of safety edge to reverse. Provide keyed momentary contact "open-close-stop".
 - 6. Acceptable Product: Raynor - Raynor PowerHoist Optima
- D. Curtain
 - 1. Material: Interlocking steel slats, 20 gauge (0.036 inch minimum thickness), roll-formed from commercial quality hot-dipped galvanized (G-90) steel in compliance with ASTM A-653.
 - a. Slat Type:
 - 1) Interior Flat Slat – Non-Insulated
 - 2) Exterior Insulated Flat Slat with back cover
 - (a) Insulation: Polyisocyanurate with R-value 6.24 and U-value 0.160.
 - (b) Back Covers: Galvanized steel, 22 gauge (0.030 inch) minimum thickness.
 - 2. Mounting: Face Mounting: fasten to face of wall on each side of door opening
 - 3. Color and Finish: Powder coated. Color as by Architect from manufacturer's standard colors.

4. Endlocks: Lateral movement of the slats to be contained by means of zinc-plated malleable endlocks fastened with two zinc-plated steel rivets.
5. E. Bottom Bar and Seal: Two roll-formed galvanized steel angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch with single-contact type bottom astragal. Structural angle bottom bar to receive one coat of rust-inhibitive primer. Finish to match door.
6. Curtain Wear Straps: Polyester.
- E. Guides
 1. Guide Assemblies: To consist of three structural steel angles, minimum 3 inches by 2 inches by 3/16 inch and fitted with removable curtain stops. Steel guides to be provided with one coat of rust-inhibitive primer.
 2. Weather Seal: Guide brush seal
 3. Jamb Construction: Reference drawings for attachment method.
- F. Counterbalance System
 1. Headplates: 3/16 inch steel plate, attached to wall angle of guide assembly with 1/2 inch diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing. Provide head plates with one coat of rust-inhibitive primer
 2. Barrel: Minimum 4-1/2 inches O.D. and 0.120 inch wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch per foot of span.
 3. Counterbalance: Provide torsion counterbalance mechanism as follows: Torsion Spring: Oil-tempered, helical torsion springs, grease packed and mounted on a continuous steel torsion shaft.
- G. Enclosures
 1. Hood: Round Hood: 24 gauge steel, finish-painted to match curtain – exterior exposure rated.
 2. Hood Baffle: With EPDM rubber seal to inhibit air infiltration through hood cavity.
- H. Hardware
 1. Locks: Furnish door system with: Provide interlock switch with cylinder lock. Refer to Section 08 7100 – Door Hardware for cylinder.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.
- B. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.
- B. Install door, guide and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.
- C. Contractor shall coordinate with electrical contractor to ensure electrical service is provided for all motor operators.
- D. Upon completion of the installation, put all items through at least ten operating cycles. Make required adjustments and assure that components are in optimum operating condition.

3.03 ADJUSTING

- A. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance and similar requirements.

3.04 DEMONSTRATION

- A. Contractor shall demonstrate the function and re-setting of all products.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

The work in this section shall include the furnishing of all items of door hardware as hereinafter specified, or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specification.

1.02 DESCRIPTION OF WORK

Door Hardware - Hardware used in building construction but particularly that used on or in connection with doors and frames, cabinets and other movable members. It also has a finished appearance as well as functional purpose and may be considered as a part of the decorative treatment of a room or building.

1.03 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
- B. Related Sections:
 - Section 081000 - Steel Doors and Frames
 - Section 082100 – Flush Wood Doors
 - Section 083300 - Coiling Doors and Grilles

1.04 COORDINATION

- A. Schedule coordination meeting to clarify sub-contractor and supplier requirements to provide a complete and functioning access control system.

1.05 QUALITY ASSURANCE

- A. Hardware has been specified herein by manufacturer's name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function. To insure a uniform basis of acceptable material, it is the intention that only manufacturer's items specified as "Acceptable and Approved" be furnished for use on this project. Obtain each type of hardware (latch and lock sets, hinges, exit devices closers) from single manufacturer, although several may be indicated as offering products complying with requirements.
- B. *Substitutions:* Request for substitutions of items of hardware not listed as "Acceptable and Approved" shall be made to the Architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be in writing or by addenda. Request for substitutions shall be accompanied by samples and/or detailed information as to the manufacturer of the product.

- C. *Underwriters' Laboratories Requirements:* Hardware for openings classed as requiring a UL label in the door schedule, or by code, shall be furnished and installed to meet the applicable requirements of NFPA 80. Hardware shall be UL listed for usage with types and sizes of fire doors specified and scheduled. Products tested shall meet requirements of UBC 7-2-1997 / UL10C
- D. *Accessibility Standards:* Hardware shall be in conformance with Article 9102, Texas Civil Statutes, Elimination of Architectural Barriers Act of Texas.
 - 1. Door Closers: The sweep period of closers shall be adjusted so that from an open position of 90 degrees, the door will take at least five seconds to move to an open position of approximately 12 degrees.
 - 2. The maximum force for pushing or pulling open door shall be as follows:
 - a. Exterior hinged doors: Not to exceed 8.5 lbf.
 - b. Sliding, folding, and interior hinged doors: Not to exceed 5 lbf.
 - c. Fire doors: Adjusted to meet minimum closing force permitted by governing fire safety standards.
- E. *Federal Accessibility Standards:* Hardware shall be in accordance with all requirements of the Americans With Disabilities Act - 1990.
- F. *Supplier:* A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two (2) years, and who is, or has in employment, a Hardware Consultant (AHC) in good standing as certified by the Door and Hardware Institute. This consultant shall have experience in the preparation of architectural hardware specifications, estimating, detailing, ordering, servicing of architectural hardware in all its branches and will be available at reasonable times during the course of the work for project hardware consultation to the Owner, Architect and Contractor. It is the hardware distributor's responsibility to coordinate the hardware specified to work with the Aluminum doors.
- G. *Pre-Installation Instructional Meeting:* Contractor shall schedule and hold a pre-installation meeting that includes the Contractor, the Architect and/or his chosen representative, the Hardware Supplier, and all installers of hardware. Instructional meeting shall be conducted by the Hardware Supplier, covering proper installation of all items of hardware to be incorporated into the Project.
- H. *Installer:* Firm with a minimum of five years of documented experience in installing the types and grade of hardware being incorporated into the Project. Three written references from Construction Administrators of previous projects required for the Architect's review before installation Contract or Subcontract is executed.
- I. *Prototype Installations:* One of each type of the following hardware installations shall be performed to the Architect's (and/or his designated representative's) approval before any installations of like-type applications are performed:
 - 1. One exterior door pair with exit devices
 - 2. One exterior single door with an exit device
 - 3. One single classroom door
 - 4. One interior pair of doors with vertical rod exit devices

1.06 REFERENCES

- A. Door Hardware in this section shall meet the following as established by the American National Standards Institute, Inc. (ANSI) which is sponsored by the Builders Hardware Manufacturers Association, Inc., (BHMA). Product tests are to be administered by the ETL Testing Laboratories, Inc., or other official testing laboratories which have been designed by BHMA for the testing of ANSI standards latest revision will be in effect.
- B.
- | | |
|----------------------------------|--------------|
| Materials and Finishes | BHMA 1301 |
| Butts and Hinges | ANSI A156.1 |
| Locks and Lock Trim | ANSI A156.2 |
| Exit Devices | ANSI A156.3 |
| Door Controls-Closers | ANSI A156.4 |
| Auxiliary Lock & Assoc. Products | ANSI A156.5 |
| Architectural Door Trim | ANSI A156.6 |
| Template Hinge Dimensions | ANSI A156.7 |
| Door Controls-Overhead Holders | ANSI A156.8 |
| Mortise Locks and Latches | ANSI A156.13 |
- C. *Listed Hardware:* Hardware which is to be installed in or on fire labeled doors and frames, Class A or lesser, single or pairs shall be tested and listed by Underwriters Laboratories and/or Warnock Hersey Fire Laboratories Division. Exit devices which are to be used as panic hardware shall be tested and listed in Underwriters Laboratories "Accident Equipment List-Panic Hardware". All listed hardware shall be in compliance with National Fire Protection Association (NFPA) Standard Number 80 IBC current year adopted and be properly stamped or labeled for easy identification.

1.07 SUBMITTALS

- A. The door hardware supplier shall, after award of a formal contract, submit to the Architect, six (6) complete typewritten copies of the proposed Door Hardware Schedule for approval. This schedule shall be prepared using the "Sequence and Format for the Hardware Schedule" as approved and recommended by the Door and Hardware Institute (DHI).
- B. When submitting schedules for approval, include six (6) copies of cut sheets on each hardware item proposed. Index it with the use of number or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in the right hand column on the same line as the respective manufacturer's numbers shall be indexed even when appearing more than once.
- C. *Samples:* As part of this contract, if requested, the hardware supplier shall provide the Architect with one sample of each item of door hardware that is to be furnished for this project.
- D. *Templates:* The hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce or otherwise prepare their material or product to receive the hardware item. If physical hardware is required by any manufacturer, the hardware

supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.

1.08 DELIVERY, STORAGE AND HANDLING

- A. All items of hardware to be delivered to the jobsite shall be completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and where necessary installation templates for manufacturer's suggested installation. They are to be clearly labeled as to conveniently identify them and their intended location in the building.
- B. A representative of the General Contractor shall receive the hardware when delivered at the jobsite. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting out, checking and storage.
- C. Door Hardware shall be delivered to the General Contractor by the hardware supplier. Direct factory shipments to the jobsite are not acceptable.
- D. The hardware shall be jointly inventoried by representatives of the General Contractor and the Hardware Supplier.
- E. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the General Contractor.
- F. All hardware shall be handled in a manner to minimize marring, scratching or damage.
- G. Store and handle all materials strictly according to the manufacturer's instructions.

1.09 WARRANTY

Door Closers shall carry a limited warranty against defects in workmanship and operation for a period of five (5) years from the date of acceptance. The balance of door hardware shall carry a limited warranty against defects in workmanship and operation for a period of one (1) year from date of acceptance. No liability is to be assumed where damage or faulty operation is due to abuse, improper usage, improper installation or failure to exercise normal maintenance.

PART 2 - PRODUCTS

2.01 FINISH OF HARDWARE

- A. Finish of items shall be as specified under the door hardware sets of this section.
- B. The finish of items not specially mentioned above nor set forth in the schedule shall be US26D, unless shown otherwise.

2.02 HINGES

- A. *Template Hinges:* Provide only template hinges which conform to ANSI A156.7.
- B. Use five-knuckle ball bearing hinges, as indicated in the hardware sets, on heavy doors, doors where high frequency service is expected, doors equipped with door closers, and all labeled doors. (Oil impregnated bearing hinges are not acceptable.)
- C. All hinges to be used on exterior doors or doors subject to special atmospheric conditions, (pool areas, chemical laboratories, sewage disposal plants, etc.) shall be of non-ferrous material, brass, bronze or stainless steel.
- D. Hinge pins, except as otherwise indicated, shall be as follows:
1. Steel hinges: Steel pins
 2. Non-ferrous hinges: Stainless steel pins
 3. Interior doors: Non-rising pins
- E. Sizes of hinges shall be as follows:

Door Thickness and Width	Hinge Height	Hinge Width
1 3/4" to 36"	4 1/2	4 1/2

- F. Number of hinges per door, provided quantities as follows:
- For doors less than 5 feet high: 1 pair
For doors 5 feet to 7 feet 6 inches high: 1 1/2 pair and additional hinge for each additional 2 1/2 feet or fraction thereof.
- G. Where projection of door trim is such as to prevent degree of opening, the proper hinge width shall be provided to allow the door to clear the trim.
- H. Provided above criteria are met, Acceptable and Approved as follows:
- Ives
Hager
Bommer
- I. Continuous Hinges shall be type scheduled and as manufactured by one of the following. Coordinate hinge type with Aluminum door supplier.

ABH
Ives
Hager

2.03 KEYING

- A. All locks and cylinders shall be factory keyed at the Schlage factory where records are established and maintained. Furnish restricted keyway as instructed by Midlothian ISD. All cylinders shall be construction Master Keyed. Stamp all keys with "Do Not Duplicate" on one side and key symbol on the other side. A keying meeting is required prior to ordering cylinders for this project. Submit a separate keying submittal for review and approval.
Furnish "3" Change keys Each Lockset
Furnish "6" Building Master Keys
Furnish "10" Construction Master Keys
Furnish "2" Construction core Removal Keys
Furnish "2" Permanent core Installation Keys

SFIC Everest D at interior doors

SFIC Everest Primus Level 9 at Exterior, Vaults, Book Rooms, Concession.

All permanent keys to be delivered to Midlothian ISD.

2.04 EXTRA HEAVY DUTY CYLINDRICAL LEVER LOCKS

- A. A single lock chassis shall accommodate 1 $\frac{3}{4}$ " to 2 $\frac{1}{4}$ " door thickness. Locksets shall be easily reversed in the field. Locksets shall have separate anti-rotation throughbolts, and shall have no exposed screws. Chassis mounting screws are to be accessible only when both the lever and rose are removed.
- B. Locksets shall have solid cast levers without plastic inserts, and shall have wrought roses on both sides. Levers shall operate independently, and shall have return spring cassettes to prevent lever sag. Lever handles shall be a minimum of 4 $\frac{5}{8}$ " in length and shall provide a minimum of 2" clearance from the surface of the door to the inside of the lever at midpoint. Lever handles may return within $\frac{1}{2}$ " of the door surface.
- C. A single lockset shall accommodate 6 to 7-pin conventional or interchangeable core cylinders (as indicated in the hardware sets) and all levels of master keying, construction master keying, visual key control, high security and interchangeable core. Cylinders may be easily changed by removing the lever without disassembling the lockset.
- D. All locks shall carry a five-year limited warranty.
- E. A $\frac{3}{4}$ " throw latchbolt for pairs of Fire Doors shall be available. All locksets with a $\frac{1}{2}$ " throw latchbolt shall be listed by Underwriters Laboratories for a label and lesser class single doors, 4' x 10'. All locksets with $\frac{3}{4}$ " throw latchbolt shall be listed for a label and lesser class pairs of doors, 8' x 10'.
- F. Certifications:
Federal Specifications FF-H-106C
ANSI A 156.2 Series 4000, Grade 1
ANSI A117.1 Accessibility Code
- G. Acceptable and Approved as Follows: (No Substitutions)

Schlage Lock

2.06 EXIT DEVICES

LOW PROFILE PUSH BAR EXIT DEVICES

- A. The maximum exit device projection shall be a maximum of 3-1/16" when activated. The exit device bar shall have an average minimum thickness of .201". The pushpad surface shall be constructed of stainless steel; pushpads with plastic or Lexan coatings shall not be acceptable. Nylon bearings and stainless steel springs shall be used for long life and durability. Only torsion or compression springs are acceptable. Extension type springs are not acceptable. All device covers shall be of cast brass, deep drawn steel or stainless steel. Latchbolts shall be of stainless steel and shall have a deadlocking latch for extra security, except at full-glass or two-light glass doors requiring narrow stile device. Mounting screws shall be concealed to deter tampering. All ferrous parts shall be zinc coated to prevent rusting.
- B. Single point, one quarter turn hex dogging shall be standard on panic listed devices. Optional key cylinder dogging shall be available, and furnished if so indicated in the hardware sets, on panic listed devices. Devices with hex key dogging shall be easily field converted to cylinder dogging.
- C. All devices shall be listed by Underwriters Laboratories for safety as panic hardware. Fire rated devices shall be UL listed for A label and lesser class doors, 4' x 8' single and 8' x 8' pair. The model number shall be located on the end cap; devices having the model number located other than on the end cap shall not be acceptable.
- D. All exit devices shall have a unitized installation feature and may be cut in the field to size. Devices shall be closed on all sides with no pinch points. The pushpad shall be designed to prevent pinching of the fingers when depressed.
- E. Exit Device trim to be throughbolted. Lever trim to be heavy duty forged escutcheon with free wheeling levers.
- F. All exit devices shall conform to Federal Specification FF-H-1820, and be certified as meeting ANSI A156.3, Grade 1 requirements.
- G. Acceptable and Approved: (No Substitutions)

Von Duprin

2.07 DOOR CLOSERS

- A. Closers shall be rack and pinion construction. They shall be non-sized with adjustable spring power. Closing the door shall be controlled by two valves, one to control closing and one to control latching speed. Closers shall be regularly furnished with fully adjustable backcheck and a backcheck selector valve allowing approximate 70 degree backcheck on both regular and parallel arm closers. Delayed action shall be available. Valves shall be concealed against unauthorized adjustment and be non-critical needle valve type. Closers shall be mounted out of line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swing doors. Provide and

install closers top jamb or on brackets and/or drop plates where special conditions exist. Include cost for any required special templates.

- B. Closers shall be certified as meeting the ANSI A156.4, Grade 1 requirements and be listed by Underwriters Laboratories for all classes of labeled doors.
- C. Door Closers shall be furnished on all labeled doors.
- D. Acceptable and Approved: (No Substitutions)

LCN

2.08 OVERHEAD STOPS AND HOLDERS

- A. Furnish overhead stops or holders of the weight, functions and materials indicated in the hardware sets.
- B. Overhead stops or holders shall be manufactured entirely of metallic components. Units containing plastic, nylon, or similar materials are not acceptable.
- C. Acceptable and Approved as follows:

ABH Manufacturing
Glynn Johnson

2.09 TRIM/KICK PLATES/DOOR STOPS

- A. All door protection plates to be manufactured of .050" stainless steel. Protection plates to be furnished 2" less than door width on single doors and 1" less than door width on pairs of doors.
- B. Wall mounted door stops shall be provided where door leaves will strike a wall at the end of their opening cycle. If other conditions exist, furnish floor stops, or, overhead stops as required.
- C. Acceptable and Approved as follows:

Trimco/Quality
Hager Accent
Ives

2.10 WEATHERSTRIP/THRESHOLDS/SMOKE SEALS

- A. Provide weatherstrip, thresholds, and/or sound seals for each opening as scheduled. Review Sill detail on Architectural drawings and furnish threshold type required.

- B. Provide smoke seal (including meeting stile seal for door pairs) for all fire rated doors. All smoke seal and astragals shall be listed by either Underwriters Laboratory or Warnock-Hersey as Category "H" – Smoke and Draft Control Gasket under the testing protocols of UBC Standard 7-2 – 1997, Part 2 and/or UL1784. All smoke seal and astragals shall, additionally, comply with the door manufacturer's listing under the same protocols.
- C. Acceptable and Approved as follows:

National Guard
Zero
Reese

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware" for (Standard Steel Doors and Frames) by the Door and Hardware Institute (DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the handicapped, or if otherwise directed by the Architect.
- B. All hardware shall be installed by a tradesman skilled in the application of commercial grade hardware.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortise parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finished have been completed on the surface to which the hardware is to be applied.
- D. At exterior doors and elsewhere as indicated, set thresholds in a bed of sealant as specified in Section 07900 to completely fill concealed voids and excluded moisture from every source. Do not plug drain hole or block weeps. Remove excess sealant.
- E. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the Owner when building is accepted. Included shall be at least five (5) each of any special adjusting and/or installation tools furnished with the hardware by the manufacturers.

PART 4 - SCHEDULES

4.01 HARDWARE SETS

Hardware Group No. 001

For use on Door #(s):

SO1.01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	MORTISE CYLINDER	20-059	626	SCH
1	EA	FSIC CORE	FSIC CORE - EVEREST D - MATCH EXISTING	626	SCH
1	EA	NOTE	REMAINDER OF HARDWARE BY DOOR/FRAME MFR	FBO	UNK

Hardware Group No. C205

For use on Door #(s):

1.02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD/224HD X EPT PREP - TYPE AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	STOREROOM LOCK	ND80TDEU RHO CON 12V/24V DC	626	SCH
1	EA	PRIMUS CORE	FSIC CORE - PRIMUS LEVEL 9 - MATCH EXISTING	626	SCH
1	EA	SURFACE CLOSER	4111 AVB SCUSH TBRST X BRKT, PLTS, SPCR AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA + 4" OVER DOOR WIDTH	AA	ZER
1	EA	GASKETING	328 X (HEAD & JAMBS)	AA	ZER
1	EA	DOOR SWEEP	39A LENGTH AS REQ	A	ZER
1	EA	THRESHOLD	65A-226	A	ZER
1	EA	DOOR CONTACT	679-05	WHT	SCE
1	EA	NOTE	CARD READER BY SECURITY CONTRACTOR		UNK
1	EA	NOTE	LOCK POWER SUPPLY BY SECURITY CONTRACTOR	FBO	UNK
1	EA	NOTE	READER POWER SUPPLY BY SECURITY CONTRACTOR	FBO	UNK

Hardware Group No. C715

For use on Door #(s):

1.01A 1.01B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD/224HD X EPT PREP - TYPE AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-EL-99-NL-OP-SNB - LENGTH AS REQ	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS CORE	FSIC CORE - PRIMUS LEVEL 9 - MATCH EXISTING	626	SCH
1	EA	FSIC CYLINDER	FSIC CYL - TYPE AS REQ X KEYED CONST CORE	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	OH STOP	100S - SIZE AS REQ	630	GLY
1	EA	SURFACE CLOSER	4011 OR 4111 AVB TBRST X BRKT, PLTS, SPCR AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA + 4" OVER DOOR WIDTH	AA	ZER
1	EA	GASKETING	328AA-S	AA	ZER
1	EA	DOOR SWEEP	39A LENGTH AS REQ	A	ZER
1	EA	THRESHOLD	65A-226	A	ZER
1	EA	DOOR CONTACT	679-05	WHT	SCE
1	EA	POWER SUPPLY	PS914 900-2RS-FA	LGR	VON
1	EA	NOTE	CARD READER BY SECURITY CONTRACTOR		UNK
1	EA	NOTE	READER POWER SUPPLY BY SECURITY CONTRACTOR	FBO	UNK

END OF SECTION

**SECTION 09 2982
GYPSUM BOARD**

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes, but is not limited to:
 - 1. Gypsum board and accessories.
 - 2. Sound-rated construction and accessories.
 - 3. Gypsum board finishing.
 - 4. Trim and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing
- B. Section 07 2100 - Thermal Insulation
- C. Section 08 3100 - Access Doors and Panels
- D. Section 09 2226 - Suspension Systems
- E. Section 09 3000 - Tiling
- F. Section 09 9000 - Painting and Coating

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. C36 - Specification for Gypsum Wallboard.
 - 2. C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
 - 3. C754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
 - 4. C840 - Specification for Application and Finishing of Gypsum Board.
 - 5. C1002 - Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
 - 6. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
- B. Association References:
 - 1. Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board"

1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
 - 1. Gypsum board partitions:
 - a. Standard systems: Maximum deflection of 1/240 of partition height.
 - b. Systems to receive water resistant gypsum board or backer board: Maximum deflection of 1/360 of partition height.
 - 2. Interior suspended ceilings and soffits: Maximum deflection of 1/360 of distance between supports.
 - 3. Exterior soffits: Withstand minimum positive and negative pressure of 20 psf with maximum deflection of 1/360 of distance between supports.
 - 4. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
 - 5. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90.

1.05 SUBMITTALS

- A. Product Data: Submit product data sheets on the following materials. Data sheets shall be marked to indicate the product and sizes used.
 - 1. Gypsum Board.
- B. Submit Material Safety Data Sheets under provisions of Section 01 7800 for the following items:
 - 1. All mastics, glues, and adhesives.
 - 2. Gypsum board, tape and bed.
 - 3. Sealant (interior use only).

1.06 **QUALITY ASSURANCE**

- A. Product Qualifications:
 - 1. Single Source Responsibility:
 - a. Obtain gypsum board products, joint treatment products, and textured coatings from a single manufacturer.
- B. Mock-ups
 - 1. At an area on the site where approved by the Architect, provide a mock-up gypsum wallboard panel.
 - a. Make the panel approximately 4'-0" square.
 - b. Provide one mock-up panel for each gypsum wallboard finish used on the Work.
 - c. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
 - d. Revise as necessary to secure the Architect's approval.
 - 2. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.
- C. Reference Standards:
 - 1. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board", except for more stringent requirements of manufacturer.
 - 2. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.
- D. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five years of documented experience.
- E. Pre-installation Meetings
 - 1. Comply with provisions of Section 01 3000 – Administrative Requirements.

1.07 **DELIVERY, STORAGE, AND HANDLING**

- A. Comply with requirements of Section 01 6000 – Product Requirements.
- B. Acceptance at Site
 - 1. Deliver material to site promptly without undue exposure to weather.
 - 2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- C. Storage and Protection
 - 1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
 - 2. Store above ground in dry, ventilated space.
 - 3. Broken, or damaged gypsum board will be rejected, whether built-in or not.

1.08 **PROJECT CONDITIONS**

- A. Project Environmental Requirements
 - 1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
 - 2. Do not begin installation of gypsum board until building is completely enclosed and protected from water infiltration.

3. Do not install gypsum board when ambient temperature is below 40°F.
4. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55°F from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.
5. Maintain illumination as required for proper installation of material.

1.09 WARRANTY

- A. Comply with requirements of Section 01 7800 – Closeout Submittals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
 1. CertainTeed Corporation: www.certainteed.com.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 3. National Gypsum Company: www.nationalgypsum.com.
 4. USG Corporation: www.usg.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BOARD MATERIALS

- A. Gypsum Board – Paper-faced
 1. Location: Use at all partition locations unless noted otherwise.
 2. Grade: ASTM C36, regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
 3. Thickness: 5/8 inch, unless otherwise indicated.
 4. Edges: Tapered.
 5. Basis of Design Products:
 - a. Partitions and ceilings: USG; Sheetrock Brand Regular.
 - b. Fire-rated partitions: USG; Firecode.
 - c. Fire-retardant wallboard for ceilings: USG; Fire Code 'C'.
- B. Gypsum Board – Abuse Resistant
 1. Location: Use at all partition locations where high impact or abuse resistant gypsum panels are noted.
 2. Thickness: 5/8 inch, unless otherwise indicated.
 3. Edges: Tapered.
 4. Basis of Design:
 - a. Partitions and ceilings: USG; Fiberock Interior Panel, Abuse Resistant.
- C. Gypsum Board - Water Resistant Tile Backer Board
 1. Fiberglass-Mat Faced Gypsum Backing Board: ASTM C1178, Type X:
 - a. Thickness: 5/8 inch.
 - b. Width: 4 feet.
 - c. Length: 8 feet.
 - d. Weight: 2.5 lb/sq. ft.
 - e. Edges: Square.
 - f. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - g. Mold Resistance (ASTM D3273): Not less than 10, in a test as manufactured.
 - h. Microbial Resistance (ASTM D6329): Will not support microbial growth.
 - i. Basis of Design:
 - 1) Georgia-Pacific Gypsum; DensShield Fireguard Tile Backer.

2.03 ADHESIVES AND JOINT TREATMENT MATERIALS

- A. Conform to requirements of ASTM C475.
 1. Joint compounds: Joint Compounds shall be drying-type products which are non-asbestos, vinyl based formulations equal to USG Taping Joint Compound and Topping

Joint Compound.

- B. Reinforcing joint tape:
 - 1. ASTM C475, 2 inch nominal width.
 - 2. For backer board, provide fiberglass tape as recommended by board manufacturer and acceptable to manufacturer of ceramic tile setting materials.
- C. Gypsum Board Screws: Self-drilling, self-tapping steel screws.
 - 1. For steel framing less than 0.03 inch thick: Comply with ASTM C1002.
 - 2. For steel framing from 0.033 inch thick to 0.112 inch thick: Comply with ASTM C954.
 - 3. Provide Type S or Type S-12 screws.
- D. Acoustical Sealant: .
 - 1. Highly elastic, water-based caulking for sound-rated partition and ceiling systems. Comply with ASTM C919 and ASTM C834.
 - 2. Basis of Design Product: USG; Acoustical Sealant.

2.04 ACCESSORIES

- A. Metal Trim for Gypsum Board:
 - 1. Conform to profile and dimensions indicated.
 - 2. Material for interior Work: Galvanized steel, 26 gage minimum.
 - 3. Basis of Design Products:
 - a. Corner beads: USG; Dur-A-Bead No. 103.
 - b. Casing beads (edge beads): USG; No. 200A.
- B. Control joints:
 - 1. Roll-formed zinc with perforated flanges.
 - 2. Size: 1-3/4 inch wide, with 1/4 inch wide center channel.
 - 3. Provide with removable tape strip over channel.
 - 4. Control joint locations and spacing shall be as shown on the drawings or as designated by the Architect.
 - 5. Basis of Design Product: USG; No. 093.
- C. Special Trim and Reveals: Extruded aluminum alloy 6063-T5, profiles as indicated.
 - 1. Basis of Design Products:
 - a. Interior Wall to Exterior Wall Trim: Gordon, Interior Specialties Division; Series # 915 – “Reveal Trim”.
 - b. Wall Reveal: Gordon Interior Specialties Division; Series # 500 – “Wall Reveal”.
 - c. Adjustable Partition Closure: Gordon Interior Specialties; Mullion Mate. Provide insulation and gaskets. Size to match application. Finish to match storefront.
 - d. Other trims and reveals where shown on the drawings.
- D. Fire wall track: As an alternate to the detail shown on the plans, provide “Fire Track” deflection track and fire stop system.
- E. Miscellaneous Accessories: Provide as required for complete installations.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Install in accordance with reference standards and manufacturer's instructions.
- B. Tolerances:
 - 1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
 - 2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
 - 3. Shim as required to comply with specified tolerances.
- C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.
- D. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, furnishings

or similar construction.

3.02 EXAMINATION

A. Site Verification of Conditions:

1. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
2. Temperature
 - a. Air Temperature in Rooms to Receive Board Materials: Between 40 degrees to 100 degrees F unless otherwise recommended by manufacturers of materials being installed.

3.03 INSTALLATION

- A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.
- B. Wall Tile shall be installed on Concrete Unit Masonry or Tile Backer Board only in toilet/shower rooms, around water fountains or other areas in which the tile might be exposed to moisture. If CMU is not provided in these areas, Tile Backer Board shall be used. Wall tile to be installed on moisture resistant gyp board where located in corridors.
- C. FRP shall be installed on Tile Backer Board only in toilet rooms, janitor closets, around water fountains or other areas in which the tile might be exposed to moisture.

3.04 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs or ICF System

1. Loosely butt gypsum board joints together and neatly fit.
2. Do not place butt ends against tapered edges.
3. Maximum allowable gap at end joints: 1/8 inch.
4. Stagger joints on opposite sides of partitions.
5. Apply ceiling boards first where gypsum board ceilings and wall occur.
6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
7. Screw board in place securely with screws spaced according to manufacturer's recommendations.
8. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
9. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
10. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
11. In all installations, gypsum wallboard shall be held above the finished floor a minimum of 1/2". Failure to comply with this requirement will be grounds for rejection on removal of the entire application.
12. Gypsum board shall be applied to cover the entire face of ICF and shall continue to the top of the ICF wall system at the floor or roof deck. At any instance where the lower portion of the ICF is covered with a different material that stops leaving the ICF foam exposed above, the cavity shall be closed with a gypsum cap or other alternative assembly and gypsum board applied to continue the coverage of the ICF to the floor or roof deck.

B. Single Layer Gypsum Board on Furring

1. Apply gypsum board with long dimension at right angles to furring channel.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.

- C. Double Layer Gypsum Board
 - 1. Fasten base layer to studs or furring with screws, and attach face layer using laminating adhesive and screws, applied according to manufacturer's instructions.
 - 2. Offset face-layer joints at least 10 inches from parallel base-layer joints.
 - 3. Screw both layers to metal supports at double layer ceiling applications and where required for fire-rated construction.
- D. Single Layer Gypsum Board Suspended for Ceilings:
 - 1. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
 - 2. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16" on centers when attachment members are provided at end joints.

3.05 ACCESSORY INSTALLATION

- A. Trim
 - 1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
 - 2. Install metal corner beads at external corners.
 - 3. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.
- B. Control Joints
 - 1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
 - 2. Install control joints within long runs of partitions at approximately 30'-0" on center or as indicated on the drawing.
 - 3. Install control joints at bulkheads as shown on the drawings but in no case shall they exceed 15'-0" on center or as indicated on the drawing. Contractor shall be responsible to insure that bulkheads comply with this requirement and shall coordinate locations with the architect if not shown on the drawings.
 - 4. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.
 - 5. Special Trim: Install as indicated on Drawings and in accordance with manufacturer's instructions.
 - 6. Install control joints at each door jamb from head of door ceiling as shown on the drawings.
 - 7. Do not install control joints behind any applied wall coverings.

3.06 FINISHING

- A. Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, "Recommended Specification: Levels of Gypsum Board Finish".
 - 1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - 2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
 - 3. Level 3: Gypsum board surfaces, where textured finishes will be used.
 - 4. Level 4: Gypsum board surfaces, except where another finish level is indicated or vinyl wall covering or custom covering is to be applied.
 - 5. Level 5: Gypsum board surfaces scheduled to receive Dry-Erase Coating.
- B. Joint Treatment
 - 1. General:
 - a. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
 - b. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the

- treatment, and until joint and finishing compounds have dried.
 - c. Apply the joint treatment and finishing compound by machine or hand tool.
 - d. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.
 - e. Joint Treatment is required at all gypsum board walls including fire protection assemblies and ICF installations above the ceiling line.
 - 2. Embedding compounds:
 - a. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
 - b. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.
 - c. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
 - d. Sandpaper between coats as required.
 - e. When thoroughly dry, sandpaper to eliminate ridges and high points.
 - C. Texturing
 - 1. All drywall texturing shall be a part of Section 09 9000 – Painting and Coating
 - D. Trim
 - 1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
 - 2. Install metal corner beads at external corners.
 - 3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.
 - E. Control Joints
 - 1. Install where indicated and specified.
 - F. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.
- 3.07 **ADJUSTING**
- A. Correct damage and defects which may telegraph through finished work.
 - B. Leave Work smooth and uniform.
- 3.08 **CLEANING**
- A. Cleaning
 - 1. Comply with requirements of Section 01 7000 – Execution and Closeout Requirements.
 - B. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.
 - C. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

END OF SECTION

**SECTION 09 6500
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient base.
- B. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019, with Editorial Revision (2020).
- C. ASTM F1861 - Standard Specification for Resilient Wall Base 2016.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2019.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.
- D. Concrete Testing Standard: Submit a copy of ASTM F710.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 2% of each type and color.
 - 3. Extra Wall Base: 2% of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Do not double stack pallets.

1.06 FIELD CONDITIONS

- A. Maintain temperature in storage area between 65 degrees F and 85 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 65 degrees F.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace flooring that fails in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
 - 1. Manufacturers:
 - a. Burke Flooring: www.burkeflooring.com.
 - b. Flexco, Inc: www.flexcofloors.com.
 - c. Johnsonite, a Tarkett Company: www.johnsonite.com.
 - d. Roppe Corp: www.roppe.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
 - 3. Height: 4 inch.
 - 4. Thickness: 0.125 inch.
 - 5. Finish: Satin.
 - 6. Length: Roll.
 - 7. Color: Refer to Section 01 6210 Schedule of Materials and Colors.
 - 8. Accessories: Premolded external corners where return is 3" or less.

2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesives
 - 1. Provide only high moisture and alkali tolerant type adhesive as recommended by the manufacturer of the material being installed.
 - 2. Asphalt emulsions and other non-waterproof adhesives will not be acceptable.
 - 3. Contact manufacturer for recommended adhesive if pH levels exceed 9 or MVER exceeds 5 pounds.
- C. Where the moisture-vapor-emission rate exceeds the manufacturers allowable rate provide and install a moisture mitigating primer as recommended by the manufacturer.
- D. Moldings, Transition and Edge Strips: Vinyl products by same manufacturer as Resilient Base.
 - 1. Product: Profile equal to "Tile-Carpet Joiner #150" manufactured by Burke Flooring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Clean substrate.
- C. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At returns of 3" or less, use premolded units.

- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.06 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.
- 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 9000
PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.
- B. Section Includes, but is not limited to:
 - 1. Exterior paints and coatings systems including; paints, stains, transparent coatings, and opaque finishes.
 - 2. Interior paint and coatings systems including; paint, stains, transparent coatings, and opaque finishes.
 - 3. Specific products and painting scheduled in this Section are based, in general, on products of Sherwin-Williams Company (noted SW). Products of other manufacturers listed in paragraph 2.01 may be substituted with approved color matches.
- C. Related Sections
 - 1. Section 05 2100 - Steel Joist Framing: Shop priming
 - 2. Section 05 5000 - Metal Fabrications: Shop priming
 - 3. Section 06 2000 - Finish Carpentry: Back priming of trim and paneling
 - 4. Division 23 - Mechanical Identification: Markers and color-coding
 - 5. Division 26 - Electrical Identification: Markers and color-coding

1.02 REFERENCES

- A. Industry Association Standards
 - 1. SSPC-SP 1 - Solvent Cleaning.
 - 2. SSPC-SP 2 - Hand Tool Cleaning.
 - 3. SSPC-SP 3 - Power Tool Cleaning.
 - 4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

1.03 DEFINITIONS

- A. Paint
 - 1. Means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.04 SUBMITTALS

- A. Shop drawings, product data, and samples under provisions of Section 01 3000 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each paint and coating product should include:
 - 1. Product characteristics
 - 2. Surface preparation instructions and recommendations
 - 3. Primer requirements and finish specification
 - 4. Storage and handling requirements and recommendations
 - 5. Application methods
 - 6. Cautions
- C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's color samples available.
- D. Verification Samples: For each finish product specified, submit 8"x10" samples that represent actual product, color, and sheen.
- E. Closeout Submittals
 - 1. Submit under provisions of Section 01 7800 - Closeout Submittals.
 - 2. Upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data

pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Single Source Responsibility:
 - a. Obtain each type of material required from single source.
- B. Pre-installation Meetings
 - 1. Comply with provisions of Section 01 3000 - Administrative Requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 - Product Requirements.
- B. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information:
 - 1. Product name, type (description)
 - 2. Application and use instructions
 - 3. Surface preparation
 - 4. VOC content
 - 5. Environmental issues
 - 6. Batch date
 - 7. Color number
- C. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- D. Store materials in an area that is within the acceptable temperature range, per manufacturers instructions. Protect from freezing.
- E. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.07 PROJECT CONDITIONS

- A. Project Environmental Requirements
 - 1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

1.08 MAINTENANCE

- A. Extra Materials
 - 1. At completion of project, deliver to Owner extra stock of materials used on project as follows:
 - a. Ten (10) gallons for each field color/type, three (3) gallons for trim and accent of each color/type.
 - 2. Store in location as directed by Owner.
 - 3. Ensure containers are sealed and identified by manufacturer, type, and color.
 - 4. Submit maintenance data under provisions of Section 01 7800 - Closeout Submittals.
 - 5. Include cleaning methods, and recommended cleaning solutions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
- B. Sherwin-Williams Co.: www.sherwin-williams.com.
- C. Kelly-Moore Paints: www.kelleymoore.com.
- D. PPG Paints: www.ppgpaints.com
- E. Benjamin Moore & Co.: www.benjaminmoore.com.
- F. TNEMEC Company Inc.: www.tnemec.com.
- G. Substitutions: Under provisions of Section 01 6000 - Product Requirements.

2.02 MATERIALS - GENERAL

A. Paints and Coatings - General

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

B. Primers

1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.03 COLOR SCHEDULES

A. Color schedule in Section 01 6210 - Schedule of Materials and Colors.

B. The Architect may select, allocate, and vary colors on different surfaces throughout the Work, subject to the following.

1. Exterior work: A maximum of three (3) different colors will be used, with variations for trim, doors, miscellaneous work, and metal work.
2. Interior work: A maximum of ten (10) different pigmented colors will be used, with variations for trim and wall surfaces and wainscots.
3. Dark tones: A maximum of five (5) dark tones will be used as accent colors for interior.

C. All painted graphics shown on the drawings shall be included in the base proposal and shall be included in this section. Contractor shall note that school colors and mascot may be released after initial color selection. Contractor shall make all necessary adjustments.

2.04 MISCELLANEOUS MATERIALS

A. Coating Application Accessories

1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer's specifications.

2.05 INTERIOR DRYWALL TEXTURING

A. Interior drywall texturing compounds shall be equal to U.S.G. "Multi-Purpose Texture Finish", or U.S.G. "Texture XII Drywall Surfer". Unless shown or otherwise indicated on the drawings, provide medium "Orange Peel or Spatter Finish" texture on walls or ceilings, as directed by Architect.

B. Mix 1 Gallon of latex paint with each 50 lbs. of texture.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin application of coatings until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before proceeding
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.02 PREPARATION

- A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
- C. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your

skin. Do not add detergents or ammonia to the bleach/water solution.

- D. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions.

E. Methods:

1. Concrete Masonry Units

- a. Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

2. Concrete, SSPC-SP13 or NACE 6

- a. This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

3. Drywall-Interior

- a. Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

4. Galvanized Metal

- a. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

5. Steel: Structural, Plate, Doors and Frames, etc.

- a. Should be cleaned by one or more of the surface preparations described below. All metal shall be thoroughly prepared to ensure adhesion of new paint to the prepared surface. All prepared surfaces shall be observed and approved by the Owner or Owners Representative before new paint is applied.
- b. Solvent Cleaning, SSPC-SP1
- 1) Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
- c. Hand Tool Cleaning, SSPC-SP2
- 1) Hand Tool Cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
- d. Power Tool Cleaning, SSPC-SP3

- 1) Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
6. Stucco
 - a. Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon.
7. Wood-Exterior
 - a. Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.
8. Wood-Interior
 - a. All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

3.03 APPLICATION

- A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Testing: Due to the wide variety of substrates, preparation methods, application methods and environments, one should test the product in an inconspicuous spot for adhesion and compatibility prior to full-scale application.
- C. Apply all coatings and materials with manufacture specifications in mind. Mix and thin coatings according to manufacture recommendation.
- D. Do not apply to wet or damp surfaces.
 1. Wait at least 30 days before applying to new concrete or masonry. Or follow manufactures procedures to apply appropriate coatings prior to 30 days.
 2. Test new concrete for moisture content.
 3. Wait until wood is fully dry after rain or morning fog or dew.
- E. Apply coatings using methods recommended by manufacturer.
- F. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
- G. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.
- H. Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- I. All drywall installation areas shall be made ready for painting by first preparing the gypsum wallboard surfaces with texturing as specified. Apply in strict compliance with manufacturer's written directions. Omit texturing where wall carpet occurs, reference Finish Schedule on drawings.
- J. At gymnasiums, contractor shall paint wood blocking for gym equipment supports to match adjacent color. Contractor shall coordinate the sequencing with all trades.
- K. Exterior Woodwork: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 2 weeks.
- L. Miscellaneous surfaces and procedures
 1. Exposed mechanical items
 - a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.

- b. Paint visible duct surfaces behind vents, registers, and grilles Sherwin Williams Pro Mar Flat Black.
 - c. Wash metal with solvent, prime, and apply two coats of alkyd enamel.
- 2. Exposed pipe and duct insulation
 - a. Apply one coat of latex paint on insulation which has been primed under other Sections; apply two coats on such surfaces when unprepared.
 - b. Match color of adjacent surfaces.
 - c. Remove band before painting, and replace after painting.
- 3. Hardware: Paint prime coated hardware to match adjacent surfaces.
- 4. Wet areas
 - a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
- 5. Exposed vents: Apply two coats of heat-resistant paint approved by the Architect.
- M. Inspection: The coated surface must be inspected and approved by the architect just prior to each coat.

3.04 REPAIR/RESTORATION

- A. For surfaces that are to receive new finish, prepare surface and apply materials as described below and per manufacture recommendation.
- B. Preparation of Existing Surfaces That Have Been Previously Painted or Varnished:
 - 1. The workmanship shall be best quality, and the surface shall be prepared in a thorough manner in order that the new finish shall be as finished as if the surface had been new with all the usual preparation for new paint or varnish.
 - 2. All previously painted or varnished surfaces or surfaces that have been previously finished in any manner shall first be prepared to receive new finish or any sort, according to the following specifications:
 - a. Existing painted sand finish plaster walls to be repainted
 - 1) Remove all scaled or loose paint.
 - 2) Fill all cracks in plaster as follows:
 - (a) Large cracks - caulk with latex sealant.
 - (b) Hairline cracks - Add 1 lb. of taping cement to 1 gallon of latex paint and brush across cracks until filled.
 - b. Existing enamel or varnished surfaces on smooth plaster or any surface
 - 1) Add 4 tablespoons of Tri-Sodium Phosphate per quart of paint thinner and wash surfaces to be repainted not less than 4 hours nor more than 7 hours before painting first coat.
 - c. Existing drywall partitions to receive new base.
 - 1) Upon removing existing rubber base, prepare wall surface to receive new base. Surface shall be leveled to meet adjacent surface. Texture wall as required to match existing.
- C. Painting Existing Surfaces after Surfaces Have Been Prepared
 - 1. Sand Finish Plaster
 - a. One coat primer-sealer colored to match finish coat. Primer-sealer will be SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - b. One coat of paint shown on schedule or two coats if required to fully cover for first quality finish.
 - 2. Concrete Masonry Units
 - a. Same as sand finish plaster.
 - 3. Smooth Plaster Walls
 - a. One coat SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - b. Second coat will be as directed by the Architect.
 - 4. Varnished Surfaces to be Revarnished

- a. Repair scratches with SW Wiping Stain, S64 series.
- 5. Enameled Trim:
 - a. Apply one coat SW Premium Wall & Wood Primer, B28W8111.
 - b. Second coat will be as directed by the Architect.
- 6. Hollow Metal Trim (Existing)
 - a. Same as enamel trim.

3.05 PROTECTION

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

PART 4 - SCHEDULES

4.01 GENERAL

- A. The Painting Schedule of this Section is based, in general, on products of Sherwin-Williams Company (noted SW on the schedule).
- B. Where painting occurs in addition or renovation projects provide low odor finishes equal to Sherwin Williams ProMar 200 Zero VOC Series.
- C. The various surfaces and areas receiving finishes maybe indicated on the drawings or as noted below. The desired finishes are shown by code numbers. Not all codes listed below may be used. The required materials for each code number shown on the finish schedule are specified below under the corresponding code numbers.

4.02 PAINTING SCHEDULE

- A. Code 100a - Exterior Metal
 - 1. Including flashing, vents, doors, window trim and grilles (except aluminum, other non-ferrous metals, and galvanized metal)
 - 2. 1st Coat: SW ProCryl Universal Metal Primer, B66-310 series.
 - 3. 2nd/3rd Coat: SW Pro Industrial Acrylic Semi-Gloss, B66-650 series.
- B. Code 100b - Exterior Metal
 - 1. Including aluminum and galvanized metals
 - 2. 1st/2nd Coat: SW ProCryl Universal Metal Primer, B66-310 series.
 - 3. 3rd/4th Coat: SW Pro Industrial Acrylic Semi-Gloss, B66-650 series.
- C. Code 100c - Exterior Metal
 - 1. For use on exterior painted handrails and exposed structural steel over properly prepared steel (SSPC-SP2).
 - 2. 1st Coat: SW ProCryl Universal Metal Primer, B66-310 series.
 - 3. 2nd/3rd Coat: Sher-Cryl High Performance Acrylic Semi-Gloss B66-350 Series
- D. Code 101 - Exterior Wood
 - 1. Including wood doors, screens and trim
 - 2. 1st Coat: SW Exterior Oil-Based Wood Primer, Y24W8020.
 - 3. 2nd/3rd Coat: A-100 Exterior Acrylic Satin, A82-100 series.
- E. Code 102a - Exterior CMU
 - 1. Except clay face brick, split face CMU, ground face/burnished CMU or cast stone:
 - 2. 1st Coat: SW PrepRite Block Filler, B25W25.
 - 3. 2nd/3rd Coat: SW A-100 Exterior Acrylic Satin, A82-100 series
- F. Code 102b - Exterior Cement Board
 - 1. 1st Coat: SW Loxon Concrete & Masonry Primer, A24W8300.
 - 2. 2nd/3rd Coat: A-100 Exterior Acrylic Satin, A82-100 series
- G. Code 103 - Interior Wood (Natural Wood)
 - 1. 1st Coat: SW Wood Classics Interior Oil Stain, A49-200 series.
 - 2. 2nd Coat: SW Wood Classics FastDry Sanding Sealer, A49-800 series.

3. 3rd Coat: SW Wood Classics FastDry Oil Varnish Satin A66F390 or Gloss A66V391.
- H. Code 104a - Interior Wood (Painted Surface, Enamel):
 1. 1st Coat: SW Premium Wall & Wood Primer, B28W8111.
 2. 2nd/3rd Coat: SW Solo 100% Acrylic Semi-Gloss, A76 series.
- I. Code 104b - Interior Metal (Painted Surface, Enamel)
 1. 1st Coat: ProCryl Universal Metal Primer, B66-310 series.
 2. 2nd/3rd Coat: Pro Industrial Acrylic Semi-Gloss, B66-650 series.
- J. Code 105 - Interior Wood (Stain & Finish)
 1. 1st Coat: SW Wood Classics Interior Oil Stain, A49-200 series. (color as selected by Architect)
 2. 2nd Coat: SW Pro Mar B44FT4 Lacquer Sanding Sealer
 3. 3rd Coat: SW Pro Mar B44FT7 Satin Lacquer
- K. Code 106 - Interior Masonry (Admin Areas)
 1. 1st Coat: SW Loxon Concrete & Masonry Primer, A24W8300.
 2. 2nd/3rd Coat: SW ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 series.
- L. Code 107 - Interior Masonry (Corridors and Student Areas)
 1. 1st Coat: SW Loxon Concrete & Masonry Primer, A24W8300.
 2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Semi-gloss, B31-2600 series.
- M. Code 108 - Interior Metal, Natatoriums (Painted Surface, Enamel)
 1. Surface Preparation: SSPC-SP 6/NACE 3.
 2. 1st Coat: SW, Series, B65G10, Corothane I Galvapac 2K Zinc Primer, DFT 3.0-4.0 mils
 3. 2nd Coat: SW, Series B58-600, Macropoxy 646 Fast Cure Epoxy, DFT 5.0-10.0 mils
 4. 3rd Coat: SW, Series B65V600, Acrolon 218 HS Acrylic Polyurethane, DFT 4.5-9.0 mils.
 5. Total DFT 12.5-23 mils.
- N. Code 109 - Floors (Two Component Epoxy Coating)
 1. 1st Coat: SW ArmorSeal 33 Epoxy Primer/Sealer, B58 series.
 2. 2nd/3rd Coat: SW ArmorSeal 1000 HS, B67-2000 series
 3. At locker rooms and wet or damp areas provide anti-slip agent equal to one of the following:
 - a. H&C Concrete Products, Sharkgrip Slip Resistant Additive
 - b. QC Construction products, QC Sure Trac
- O. Code 110a - Two Component Epoxy Coating for CMU Walls (All Food service Areas)
 1. 1st Coat: SW Heavy Duty Block Filler B42W46. This material is to be applied at the rate of 75sq. ft. per gallon or until surface is filled free from any voids or holes. Surface is to be filled free from excess mortar and cracks.
 2. 2nd/3rd Coat: SW Water Based Catalyzed Epoxy B70 Series/B60V15 Hardener.
- P. Code 110b - Two Component Epoxy Coating for Gyp Board Walls (All Food service Areas)
 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 2. 2nd/3rd Coat: SW Water Based Catalyzed Epoxy B70 Series/B60V15 Hardener.
- Q. Code 110c - Epoxy for CMU Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
 1. 1st Coat: SW Kem Cati-Coat HS Epoxy Filler/Sealer, B42W400.
 2. 2nd/3rd Coat: SW Water Based Epoxy B70 Series/B60V15 Hardener.
- R. Code 110d - Epoxy for Gyp Board Walls at "Wet/Shower" Areas, Restrooms, Vehicle Wash Bays, Natatoriums, Janitor, & Mechanical Rooms
 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 2. 2nd/3rd Coat: SW Water Based Epoxy B70 Series/B60V15 Hardener.
- S. Code 111 - Exterior Concrete Walls (Painted or Unpainted)
 1. After all work has been completed, apply 2 coats of Sure Klean "Weather Seal SS" as manufactured by Prosoco, Inc., Dallas, Texas or prior approved equal. Apply in full

- compliance with manufacturer's specifications.
- T. Code 112 - Exterior Concrete or Stucco
 - 1. 1st/2nd Coat: BASF MasterProtect HB 300SB. Apply according to manufacturer's specifications for complete coverage and comply with manufacturer's five year guarantee on labor and materials. Secure and deliver to the Architect the manufacturer's standard five year guarantee.
 - U. Code 113 - Not Used
 - V. Code 114 - Green Screen Paint
 - 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2. 2nd/3rd Coat: Water Based Acrylic Chroma Key Matte Green Video Paint.
 - W. Code 115a - Interior Drywall (Admin Area Walls and Ceilings/Bulkheads)
 - 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Eg-Shel, B20-2600 series.
 - X. Code 115b - Interior Plaster (Standard Ceilings/Bulkheads)
 - 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Eg-Shel, B20-2600 series.
 - Y. Code 116a - Interior Drywall (Walls in Corridors and Student Areas)
 - 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2. 2nd/3rd Coat: SW Pro Mar 200 Zero VOC Latex Semi-gloss, B31-2600 series.
 - Z. Code 116b - Interior Plaster (High Humidity Ceilings)
 - 1. 1st Coat: SW ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2. 2nd/3rd Coat: SW Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-150 series.
 - AA. Code 117 - Exterior Masonry Surfaces
 - 1. 1st Coat: SW Loxon Concrete & Masonry Primer, A24W8300.
 - 2. 2nd/3rd Coat: SW ConFlex High Build Elastomeric, A5-400 Series.
 - BB. Code 118 - Not Used
 - CC. Code 119 - Existing Metal Lockers - Electrostatic Enamel
 - 1. Description: A single component modified acrylic enamel for use with electrostatic spray equipment.
 - 2. Surface Preparation: Surface must be clean and free of oils, grease, loose paint, rust, polish, waxes and moisture. Sand and remove all ropes and runs on existing metal lockers. Surface must have feathering around scratches. Test surface for priming and adhesion to determine if a base coat should be removed and primed.
 - 3. 1st/2nd Coat: Electrostatic Enamel Semi-Gloss (182 Line - Sumter Coatings, Inc. Sumter, SC)
 - 4. Primer: As recommended by manufacturer for existing application.
 - 5. Applicators
 - a. Electro-Static Refinishers Inc., Dallas, TX; 972-296-2173
 - b. ElectroCoat, Houston, TX; 800-508-9449
 - DD. Code 120 - Interior Metal, Structural Steel and Deck in Crawl Space (Painted Surface, Enamel)
 - 1. Surface Preparation: SSPC-SP 6/NACE 3.
 - 2. 1st Coat: SW, Series, B65G10, Corothane I Galvapac 2K Zinc Primer, DFT 3.0-4.0 mils
 - 3. 2nd/3rd Coat: SW, Series B58-600, Macropoxy 646 Fast Cure Epoxy, DFT 5.0-10.0 mils
 - EE. Code 121 - Ceilings (Exposed Structural Steel and Deck)
 - 1. Touch-up factory prime coat on ferrous steel with SW ProCryl Universal Metal Primer, B66-310 series.
 - 2. 1st /2nd Coat: SW Acrylic Waterborne Dryfall B42W1.
 - FF. Code 122 - Not Used
 - GG. Code 123 - Concrete Floor Sealer:
 - 1. Properly clean surface as per manufacturer's recommendations.

2. 1st/2nd Coat: BASF MasterKure CC 250 SB (Formerly Kure-N-Seal)
 3. At locker rooms and wet or damp areas provide anti-slip agent equal to one of the following:
 - a. H&C Concrete Products, Sharkgrip Slip Resistant Additive
 - b. QC Construction products, QC Sure Trac
- HH. Code 124 - Structural & Miscellaneous Steel, Steel Bar Joists
1. 1st Coat: SW Opti-Bond (B50W100).

END OF SECTION

**SECTION 10 1400
SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building, Wayfinding and Title Signs.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Submit shop drawings showing each typical room and door sign type for fabrication, including typical drawings and details for each type to be provided.
 - 2. Submit shop drawings showing all graphic, wayfinding or other "special" signage for fabrication, including drawings and details for each to be provided.
 - 3. Shop drawings shall include plan location, directional information, size, font, color, mounting details, and scaled representation of configuration for each sign (included, but not limited to, building signs, directional/ wayfinding signs, and plaques) and graphic elements.
- D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. Request content of signs from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- E. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- G. Verification Samples: Submit samples showing colors specified.
- H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 - Product Requirements.
- B. Package signs as required to prevent damage before installation.
- C. Package room and door signs in sequential order of installation, labeled by floor or building.
- D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

- B. Maintain this minimum temperature during and after installation of signs.

1.07 **WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

- A. Building, Wayfinding and Title Signs:
 - 1. Cosco Industries: www.coscoarchitecturalsigns.com.
 - 2. FASTSIGNS: www.fastsigns.com.
 - 3. Inpro: www.inprocorp.com.
 - 4. A.R.K. Ramos Signage Systems: www.arkramos.com.
 - 5. ASI Signage: www.asisignage.com.
 - 6. Best Sign Systems, Inc.: www.bestsigns.com
 - 7. Gemini Inc.: www.geminisignproducts.com
 - 8. The Southwell Company: www.southwellco.com.
 - 9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 **SIGNAGE APPLICATIONS**

- A. Accessibility Compliance: Signs are required to comply with ADA Standards, TAS, ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Code Required Signage: Fire Protection and Utility Equipment Identification Access and Emergency Signage. See "Schedules" article below.
- C. Building, Wayfinding and Title Signs:
 - 1. Building Letters.
 - a. Use individual cast aluminum alloy, smooth surface letters.
 - b. Letters shall be Arial for bidding purposes unless noted otherwise on the drawings.
 - c. Finish shall be baked enamel, primed and spray coated with two (2) coats of baked enamel.
 - d. Reference drawings for font heights and locations.
 - e. Font and finish are for bidding purposes only. Submit samples to Architect for approval before fabrication of any material
 - f. Provide (5) 8" high numbers for the building address. Verify location with Building Inspector. Color shall be contrasting to building. Provide one set per building.
 - 2. Letters shall be Arial for bidding purposes unless noted otherwise on the drawings.
 - 3. Reference drawings for font heights and locations.
 - 4. Font and finish are for bidding purposes only. Submit samples to Architect for approval before fabrication of any material.
 - 5. All exterior wall, roof, and structure mounted letters/signs to be engineered by the sign manufacturer for mounting requirements and structural connections in accordance with the applicable wind loading and building codes. Sign manufacturer shall coordinate with adjacent building trades for connection requirements prior to other building elements being installed.

2.03 **ACCESSORIES**

- A. Countersunk Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape and clear silicone adhesive.

PART 3 EXECUTION

3.01 **EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
 - 1. Examine work area with installer present.

2. If existing conditions are not as required to properly complete the work of this section, notify Architect.
 3. Do not proceed with installation until deficiencies in existing conditions have been corrected.
- B. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 **INSTALLATION**

- A. Building Identification Signage
1. General: locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 2. Install signs level, plumb, and at the height indicated with sign surfaces free from distortion or other defects in appearance.
 3. Cleaning and Protection: After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the owner.

3.03 **SCHEDULES**

- A. Code Required Signage.
1. Fire Protection Equipment Identification, exterior access.
 - a. Location(s): Permanently installed and readily visible. Verify mounting location with AHJ.
 - 1) Fire Suppression Sprinkler Riser and Valve Rooms.
 - b. Copy: "RISER ROOM".
 - c. Color: Copy to be White in contrast to its Red background.
 2. Fire Protection and Utility Equipment Identification, interior access.
 - a. Location(s): Verify mounting location with AHJ.
 - 1) Air-Conditioning Systems Control Rooms.
 - 2) Fire Suppression Sprinkler Riser and Valve Rooms.
 - 3) Fire Detection, Suppression or Control.
 - b. Copy: For bidding purposes, use room name as indicated on drawings. Verify final copy with Architect prior to fabrication.
 - c. Color: Copy to be in contrast to its background.
 3. Elevator Lobby Emergency Signs: Provide one standardized design posted adjacent to each elevator call station on all floors. Copy: "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS".

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.
- D. Fireman's Knox Items: Box.

1.02 RELATED REQUIREMENTS

- A. Section 01 4100 - Regulatory Requirements
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 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 a fire extinguisher without a cabinet.

1.04 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide current edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).
- C. UL (DIR) - Online Certifications Directory Current Edition.
- D. International Fire Code.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
- C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinguishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.
- G. Material and Safety Data Sheets for all mastics, glues, and adhesives and for insulating material for fire doors.

1.06 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.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 - Product Requirements.
- B. Store extinguishers in protected location until after final cleaning is completed.

1.08 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.09 WARRANTY

- A. Comply with requirements of Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers and Cabinets and Accessories:
 - 1. JL Industries, Inc: www.jlindustries.com.

2. Larsen's Manufacturing Co: www.larsensmfg.com.
 3. Samson Products, Inc.: www.samsonproducts.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fireman's Knox Box:
1. Knox Company; www.knoxbox.com.
 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
 2. UL Rating: 2A-10B:C, minimum.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
1. Product: MP10 for all typical installations.
 2. Product: MP5 at Elevator Equipment Rooms and Science Labs.
 3. Class: A:B:C type.
 4. Size: 5 and 10 pound.
- C. Halotron I Type Fire Extinguishers: Stainless steel tank, with pressure gage.
1. Product: HT5 at Computer Lab.
 2. Class: A:B:C type.
 3. Size: 5 pound.
- D. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
1. Product: WC-6L (6 liter capacity) at Kitchen (20 ft. away from hood).
 2. Class: K.
 3. Size: 1.6 gallons.

2.03 FIRE EXTINGUISHER CABINETS

- A. Product - reference schedule below:

Wall Construction	Model	Fire Rated	Projection	Box Depth	Wall Depth
3-5/8" Metal Stud or 6" CMU	AL-2409-6R	No	2-1/2"	6"	4"
3-5/8" Metal Stud or 6" CMU	AL-FS-2409-R4	Yes	3-1/2"	6"	4"
8" CMU or wider	AL-2409-6R	No	2-1/2"	6"	4"
8" CMU or wider	AL-FS-2409-6R	Yes	2-1/2"	6"	4-7/8"
8" CMU	AL-2712-RA	No	4"	8"	4-1/2"
8" CMU	AL-FS-2712-RA	Yes	4"	8"	5-3/8"

- B. Cabinet Construction: Non-fire rated.
1. Formed primed steel sheet; 0.036 inch thick base metal.
- C. Cabinet Configuration: Semi-recessed type.
1. Projected Trim: Returned to wall surface, with 2-1/2 inch projection, and 1 inch wide face.
- D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge. Provide solid doors at athletic and shop areas.
- E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- G. Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Clear satin anodized aluminum.

- I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. If extinguisher is not located in a cabinet, provide bracket no. 860.
- C. Graphic Identification: Applied decal use vertical decal spelling.

2.05 FIREMAN'S KNOX BOX

- A. Provide and install emergency access lock box where shown on the drawings.
 - 1. Mount: Recessed (7"x7"x3.25"), provide recessed mounting kit with face flange. Mount at 6'-0" above ground level, verify with fire marshal.
 - 2. Lock: U.L. Listed. Double action rotating tumblers and hardened steel pins accessed by a biased cut key.
 - 3. Finish: Pre-treatment – Zinc Phosphate; Final Coating – weather resistant polyester powdercoat.
 - a. Color: Black.
 - 4. Alarm: Alarm tamper switch. Connect to buildings security system.
 - 5. Model: "Knoxbox Series 3200".
- B. Provide and install two-position electric override key switch with mounting plate. Provide lock cover with weather resistant operation and an emergency agency ID label. Controls emergency power system shutoff. Refer to electrical drawings for locations.
 - 1. Mount: Recessed, provide recessed mounting kit with face flange. Mount as directed by fire marshal.
 - 2. Alarm: Alarm tamper switch. Connect to buildings security system.
 - 3. Model: "Knoxbox 3502 with key switch".

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings at locations shown on the Drawings. Install compliant with applicable accessibility requirements.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10 7300
PROTECTIVE COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-engineered, pre-finished extruded aluminum wall mounted hanging canopies.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. AAMA 612 - Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2002.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels - American Architectural Manufacturers Association; 2011
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 6000 Tensile Strength; 2010.
- E. ASTM A792/A792M - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by Hot Dip Process; 2010.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.
- H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs; 2002 (Reapproved 2008).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.
- C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by profession engineer.
- D. Samples: 12 inches by 12 inches minimum illustrating design, workmanship and finish color.
- E. Designer Qualification Statement.
- F. Specimen Warranty: Furnish a copy of manufacturer's standard warranty.
- G. Installer Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work licensed in Texas.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with no less than five years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section, and;
 - 1. With minimum five years of documented experience.
 - 2. Approved by manufacturer.
- D. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway or canopy system (sidewalks, curbs, building fascias, etc.).

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site ready for erection.
- B. Package using methods that prevent damage during shipping and storage on site.
- C. Store materials under cover and elevated above grade.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

- B. Correct defective work within a one-year period after date of Substantial Completion.
- C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Protective Covers:
 - 1. AVAdek: www.avadek.com.
 - 2. Architectural Fabrication, Inc.: www.arch-fab.com
 - 3. Aluminum Techniques Inc.: www.aluminumtechniques.com
 - 4. Canopy Solutions, LLC: www.canopy-solutions.com
 - 5. DITT-Deck, Dittmer: www.dittdeck.com
 - 6. Peachtree Protective Covers: peachtreecovers.com
 - 7. East Texas Canopy, Inc: www.easttexascanopy.com
 - 8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CANOPY SYSTEMS

- A. The Contractor's Canopy Engineer or another Structural Engineer hired by the Contractor shall evaluate the capacity of the existing structure to withstand loads that would be imposed by the canopy and either verify that there is sufficient capacity or modify the existing structure in a way that is approved by the Architect. The Canopy Engineer shall design the connection. The Contractor shall be permitted to submit alternative configurations for consideration by the Architect if the alternative configurations do not increase the cost of construction or the schedule.
 - 1. Exception: Where specifically noted on the drawings that the existing structure has been evaluated by the Architect or a Subconsultant of the Architect and it has been determined that the structure is acceptable to withstand the loads imposed by the canopy or details are provided for the modification of the existing structure, then the Contractor's Canopy Engineer does not need to evaluate the existing structure but does need to submit to the Architect the unfactored loads imposed for review before fabrication.
- B. Canopy: Shop fabricated, shop finished, extruded aluminum decking, (roll-formed not acceptable), outriggers, fascia and hanging rod assemblies free of defects impairing strength, durability or appearance.
 - 1. Configuration: As indicated on drawings.
 - 2. Sizes: As indicated on drawings.
 - 3. Design Criteria: Design and fabricate to resist loads without failure, damage, or permanent deflection as dictated by the applicable building code.
 - 4. Finish: Natural anodized, Class I AAMA 611 AA-M12C22A41 or AAMA 612 with electrolytically deposited organic seal; not less than 0.7 mils thick.
 - 5. Provide a complete system ready for erection at project site.
 - 6. Shop-fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 MATERIALS

- A. Aluminum Extrusions: ASTM B209 or B 221.
- B. Aluminum Coated Steel Sheet: ASTM A792/A792M.
- C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.
- D. Fasteners: ASTM F593 stainless steel or ASTM A 307 carbon steel.
 - 1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
 - 2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
 - 3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
 - 4. Tek Screws: not permitted

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Verify that dimensions of supporting structure are within plus/minus 1/8 inch of dimensions shown on shop drawings.
- C. Verify that all adjacent painting, roofing, masonry work, and other work that might damage finish has been completed prior to installation of sun screens.
- D. Do not install until after all adjacent painting, roofing and masonry have been completed.
- E. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Set units level, plumb, with uniform joints, and aligned with building elements.
- C. Separate dissimilar metals using concealed bituminous paint or non-absorbent gasket.
- D. Anchor units to structure as indicated on the drawings.
- E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.
- F. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.03 TOLERANCES

- A. Maximum Variation from Level/Plumb: Plus/Minus 1/8 inch.

3.04 CLEANING

- A. Clean exterior surfaces units of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 PROTECTION

- A. Protect units after installation to prevent damage due to other work until the Date of Substantial Completion.

END OF SECTION

SECTION 11 1300
DOCK LEVELER

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Loading dock equipment of the following types:
 - 1. Mechanical dock levelers.
 - 2. Dock bumpers.

2.02 RELATED SECTIONS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 05 5000 - Metal Fabrications.

2.03 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI MH29.1 - Industrial Scissor Lifts.
 - 2. ANSI MH30.1 - Industrial Loading Dock Boards (Ramps).
 - 3. ANSI MH30.3 - Vehicle Restraining Devices (Safety, Performance, and Testing).

2.04 SUBMITTALS

- A. See Section 01 3000-Administrative Requirements, for submittal procedures.
- B. Product Data: For each product specified. Indicate unit dimensions, method of anchorage, and details of construction. Indicate materials and finish, installation details, roughing-in measurements, and operation of unit.
- C. Shop Drawings:
 - 1. Indicate required opening dimensions, tolerances of opening dimensions, placement dimensions, and perimeter conditions of construction.
 - 2. Wiring diagrams including location of control stations and disconnect switches.
- D. Assurance/Control Submittals:
 - 1. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
 - 2. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

2.05 QUALITY ASSURANCE

- A. Dock Levelers: Conform to requirements of ANSI MH30.1.
- B. Vehicle Restraints: Conform to requirements of ANSI MH30.3.
- C. Manufacturer Qualifications:
 - 1. Manufacturer specializing in manufacturing Products specified with minimum 30 years' experience.
 - 2. Manufacturer to have quality assurance improvement programs and ISO certified.
 - 3. Manufacturer shall be associated with Loading Dock Equipment Manufacturers (LODEM) setting ANSI standards.
 - 4. Manufacturers welding procedure compliant with A.W.S.D1.1 specifications.
- D. Installer Qualifications: Company specializing in performing the Work of this Section with minimum 5 years' experience.

2.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards. Store materials within absolute limits for temperature and humidity recommended by manufacturer. Protect from damage.
- B. Store products in manufacturer's labeled packaging until ready for installation.

2.07 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty.

PART 2 PRODUCTS

3.01 **MANUFACTURERS**

- A. Blue Giant Equipment Corporation, www.bluegiant.com
- B. Substitutions: See Section 01 6000-Product Requirements.

3.02 **MECHANICAL DOCK LEVELERS**

- A. Mechanical Dock Levelers: 'A' Series Dock Levelers, Model 'MA' as manufactured by BLUE GIANT.
 - 1. Type: Recessed, pit installed hinged dock leveler. Manually operated dock leveler shall be mechanical and complete with cable locking hold down mechanism and 4 inches (102 mm) assured motion float (maintained deck tilt). Pit Depth: Front 20 inches (508 mm) and Rear 19-1/2 inches (495 mm). Deck length includes 16 inches (406 mm) lip.
 - a. Model MA6008: Deck Size - 72 inches (1829 mm) W by 99-1/2 inches (2527 mm) L.
 - 2. Function:
 - a. Vertical Travel: Working range of 12 inches (305 mm) above and 12 inches (305 mm) below dock level.
 - b. Automatic Vertical Compensation: Unit provides float of 12 inches (305 mm) above and 12 inches (305 mm) below dock level.
 - c. Automatic Lateral Compensation: Provides maintained side-to-side deck tilt of up to 4 inches (102 mm) to compensate for canted truck beds.
 - d. Lip Operation: Mechanically operated lip that automatically extends and locks into position. Lip will yield under impact of incoming truck and will automatically drop pendant upon truck's departure. The length of the lip extension shall not be less than 16 inches (406 mm) from the ramp edge.
 - 3. Operation:
 - a. Mechanical Operating System: No manual lifting involved. Attendant pulls release chain that activates the locking hold down system designed to minimize cross traffic bounce and provide instant hold.
 - b. The deck is driven up by heavy-duty lift springs and the lip is smoothly powered out. Dock is then "walked" down onto the truck bed.
 - c. A second chain is pulled to disengage the fall safe legs and allow below level operation.
 - d. When the truck departs, the lip releases, allowing the unit to be returned to the cross-traffic position.
 - 4. Rated Capacity:
 - a. Welding procedure compliant with A.W.S.D1.1 specifications. All units rated in compliance with ANSI MH30.1. Structural deck support to include minimum six each high-tensile solid steel J-beam members.
 - b. Rated Capacity: Minimum 30,000 lbs, reference drawings for details.
 - 5. Standard Safety Devices:
 - a. Mechanical fall safe legs to limit free fall and below level lip control for end-loading; standard only in the US; optional in Canada.
 - b. Toe Guard: Working range metal toe guard protection.
 - c. Cross traffic support - lip engaged in saddles.
 - d. Corner safety stops.
 - e. Telescopic v-grooved maintenance strut, integral to unit.
 - f. Beveled lip.
 - 6. Finish and Color:
 - a. Powder Coated and bake cure, resistant to chemicals, corrosion, and incorporates UV inhibitors to reduce fading of colors (standard).
 - b. Deck, lip, frame powder coated gray or color as selected.

- c. Toe guards painted safety yellow as specified by ANSI Z535.1. High visibility OSHA safety striping on stationary side toe guards.
- 7. Warranty: Warranties are subject to standard limitations on liability. Consult manufacturer for full details on warranty information and product registration.
- 8. Standard Accessories:
 - a. Night Locks.
 - b. 16 inch (406mm) long lip.
- 9. Dock Bumpers: Standard, two model DB411 laminated bumpers 14 inches (356 mm) W by 10 inches (254 mm) H by 4.5 inches (114 mm) D.
- 10. Optional Features/Accessories: Provide the following optional features/accessories:
 - a. Side weather seals, nylon brush style.
 - b. Rear weather seals, nylon brush style.
 - c. Toe Guard: Full yellow operating range metal toe guard protection.
 - d. Mechanical fall safe legs to limit free fall and below level lip control for end-loading, supplied as standard in the US; optional in Canada.
 - e. Vehicle Restraints.

3.03 DOCK BUMPERS

- A. Dock Bumpers: Two per dock leveler as manufactured by Blue Giant.
 - 1. Type: Laminated and shall be made of nylon impregnated heavy-duty industrial rubber and punched to receive 5/8 inch (16 mm) supporting rod. Bumper material shall be assembled with two 3 inches by 3 inches by 1/4 inch (76 by 76 by 6 mm) thick steel angles, factory painted and fastened with threaded rod and nut. Dimensions include angle iron for laminated bumpers.
 - a. Model DB411: 4-1/2 inches D by 14 inches W by 10 inches H (114 mm D by 356 mm W by 254 mm H).

PART 3 EXECUTION

4.01 EXAMINATION

- A. Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- B. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- D. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

4.02 INSTALLATION

- A. Install products in prepared opening in accordance with manufacturer's instructions. Set square and level. Anchor unit securely, flush with dock. Weld back of dock leveler to pit frame. Touch-up welds with matching paint.
- B. Install dock bumpers in accordance with manufacturer's instructions.

4.03 ADJUSTING

- A. Adjust installed unit for smooth and balanced operation.

END OF SECTION

SECTION 13 3419
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufacturer-engineered, shop-fabricated structural steel building frame.
- B. 'R' Panel Roof Panels.
- C. Panel Rib Wall Panels.
- D. Metal Soffit Panels.
- E. Gutters and Downspouts.
- F. Building Insulation.
- G. Roof Accessories including Roof Curbs and Pipe Flashing.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 05 5000 - Metal Fabrications.
- C. Section 07 9005 - Joint Sealers: Sealing joints between accessory components and wall system.
- D. Section 08 1113 - Hollow Metal Doors and Frames.
- E. Section 09 9000 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. AISC 360 - Specification for Structural Steel Buildings 2016.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- E. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength 2014a.
- F. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric) 2014a.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2018.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.
- I. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality 2014.
- J. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel 2018.
- K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.
- L. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2010 (Reapproved 2015).
- M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2011 (Reapproved 2015).
- N. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- O. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings 2016.
- P. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.

- Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).
- T. MBMA (MBSM) - Metal Building Systems Manual 2012.
- U. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies Current Edition, Including All Revisions.

1.04 DESIGN REQUIREMENTS

- A. Design members to comply with all governing building code requirements and withstand the design loads indicated on the drawings. Unless a greater load is indicated otherwise, design for a minimum 20 psf roof live load without any live load reduction, 6 psf collateral load, 5 psf nominal snow load, dead load as determined by the Pre-Engineered Metal Building Engineer, and calculate positive and negative wind loads in accordance with applicable code.
- B. Design members to withstand UL 580 uplift class 90.
- C. Exterior wall and roof system shall withstand imposed loads with a maximum allowable live load deflection and maximum allowable wind load deflection of 1/180 over areas without a ceiling, 1/240 over areas with a nonplaster ceiling, 1/360 over areas with a plaster ceiling and 1/600 over areas supporting masonry veneer either vertically or horizontally. The lateral force resisting system shall withstand imposed Main Wind Force Resisting system wind pressures with a maximum allowable lateral deflection of 1/180 over buildings with no applied veneer (e.g. brick, concrete masonry, stucco, etc...), 1/300 over buildings with applied veneer that does not extend higher than 4 feet above the foundation, and 1/600 over buildings with applied veneer that extends higher than 4 feet above the foundation, or 1" maximum drift, whichever is the more stringent deflection requirement. The Pre-Engineered Metal Building Engineer shall have the option to design the Main Wind Force Resisting system for 10-year MRI wind speeds (minimum), in lieu of the wind speeds required for strength as determined by the building Risk Category, for deflection purposes only if the Pre-Engineered Metal Building Engineer deems these deflections appropriate.
- D. Seismic Loads: Calculate and apply seismic loads in accordance with the requirements of applicable building code and as indicated in the structural drawings.
- E. Anchor Bolts: Furnish anchor bolt diameters, calculated on the basis of stress in the steel bolt, to resist the column reactions induced by the design loads on the structure. Anchor bolt lengths and embedment details shall be as shown on the structural drawings.
- F. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.
- G. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 120 degrees Fahrenheit.
- H. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on profiles, component dimensions, fasteners.
- C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation ; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional

seal and signature. The Metal Building Engineer shall seal all metal building shop drawing submittals.

- D. Samples: Submit two samples of precoated metal panels for each color selected, 2 by 3 inch in size illustrating color and texture of finish.
- E. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.
- F. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.
- G. Project Record Documents: Record actual locations of concealed components and utilities.
- H. Closeout Submittals:
 - 1. Submit under provisions of Section 01 7800 – Closeout Submittals.
 - 2. Maintenance Data: Include draft specimen warranty.
- I. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
 - 1. All mastics, glues, and adhesives
 - 2. Sealant (interior use only).

1.07 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
 - 1. Design Engineer Qualifications: Licensed in Texas.
 - 2. Comply with applicable code for submission of design calculations as required for acquiring permits.
 - 3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.
- B. Perform work in accordance with AISC 360 and MBMA (MBSM).
 - 1. Maintain one copy on site.
- C. Perform welding in accordance with AWS D1.1/D1.1M.
- D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
 - 1. Not less than three years of documented experience.
- E. Erector Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Section 01 6000 – Product Requirements.
- B. Storage and Protection
 - 1. Protect materials in accordance with manufacturer's instructions.
 - 2. Damaged materials will be rejected, whether built-in or not.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer shall warranty installed system for the periods described herein, starting from Date of Substantial Completion against all the conditions indicated below. When notified in writing from Owner, manufacturer/installer shall, promptly and without inconvenience and cost to Owner, correct said deficiencies.
 - 1. Materials and Workmanship Warranty: 5 years.
 - 2. Finish Warranty:
 - a. Include coverage for exterior pre-finished surfaces to cover pre-finished color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading.
 - 1) Panel finish: 20 years.
 - 3. 'R' Panel Performance Warranty: Furnish written, single source, stating sheet metal roofing system and flashing under this Section will be maintained in watertight condition

and defects resulting from the following items will be corrected without cost to Owner for a period of 10 years.

- a. Faulty workmanship.
 - b. Defective materials including sealants and fasteners.
 - c. Water infiltration.
 - d. Weathertightness
4. Standing Seam Roof (SSR) Panel Performance Warranty: Furnish written, single source, no dollar limit warranty, stating sheet metal roofing system and flashing under this Section will be maintained in watertight condition and defects resulting from the following items will be corrected without cost to Owner for a period of 20 years.
- a. Faulty workmanship.
 - b. Defective materials including sealants and fasteners.
 - c. Water infiltration.
 - d. Weathertightness.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Buildings Systems:
1. Butler Manufacturing Company: www.buttermfg.com/#sle.
 2. Ceco Building Systems: www.cecobuildings.com/#sle.
 3. Kirby Building Systems: www.kirbybuildingsystems.com.
 4. MBCI: www.mbc.com.
 5. Mesco Building Solutions; www.mescobuildingsolutions.com
 6. Nucor Building Systems: www.nucorbuildingsystems.com/#sle.
 7. Red Dot Buildings: www.reddotbuildings.com
 8. Star Manufacturing: www.starbuildings.com.
 9. VP Buildings: www.vp.com.
 10. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ASSEMBLIES

- A. Primary Framing: Rigid Frame solid web framing consisting of tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns. Provide a clear span that supports the loads at bay spacings indicated.
1. Rigid frames shall consist of welded up plate section columns and roof beams complete with necessary splice members and plates for bolted field assembly.
 2. All base plates, cap plates, ridge plates and stiffener plates as required shall be factory welded into place and have the proper bolt connection holes shop fabricated.
 3. All splice plates shall be shop fabricated in proper sizes with bolt connection holes shop fabricated.
 4. All bolts for field assembly of frame members shall be high strength bolts of proper sizes complete with washers as indicated on erection drawings.
 5. There will be no field modification of rigid frame members, unless authorized and specified on the manufacturer's drawings.
 6. Bay Spacing: As noted on drawings.
- B. Endwall Framing: Corner posts, endposts and rake beams.
1. All base plates, cap plates, ridge plates and stiffeners as required shall be factory welded into place and have the proper bolt connection holes shop fabricated.
 2. All splice plates shall be shop fabricated in proper sizes with bolt connection holes shop fabricated.
 3. Columns, beams and posts shall be shop fabricated complete with proper holes for the attachment of secondary structural members in proper locations.

- C. Secondary Framing: Purlins, Girts, Eave struts, Flange bracing, Sill supports, and Clips, and other items detailed.
 - 1. Purlins: Zee-shaped; 8" and 9 1/2" depth as required; with minimum yield strength of 55,000 psi; simple span or continuous span as required for design.
 - a. Outer flange of all girts and purlins shall contain factory punched holes for panel connections.
 - 2. Girts: Zee-shaped (unless otherwise noted on the drawings); 8" and depth as required, with minimum yield strength of 55,000 psi; simple span or continuous span as required for design.
 - a. Outer flange of all girts and purlins shall contain factory punched holes for panel connections.
 - 3. Transbay Members: Open web, parallel chord, secondary joists; simple span, utilizing materials, sizes and yield strength as required.
 - 4. Wind Bracing: Portal, torsional, diagonal bracing with or without diaphragm in accordance with manufacturer's standard design practices; utilizing rods, angles, and other members, with minimum yield strengths as required for design.
 - a. Bracing will be located in second bay from each end of the building or as indicated on the drawings.
 - 5. Primary Frame Flange Bracing: Attached from purlins or girts to the primary framing, minimum yield strength as required for design.
 - 6. Base Angles: 2 inch x 3 inch x 0.059 inch steel angles, with minimum yield strength of 55,000 psi, anchored to the floor slab or grade beam with power driven fasteners or equivalent at a maximum spacing of 2 feet on center and not more than 6 inches from the end of any angle member.
 - 7. Door Headers and Jambs: Cee-shaped; depth as required; with minimum yield strength of 55,000 psi.
 - 8. Sag Angles and Bridging: Steel angles, with minimum yield strength of 36,000 psi.
- D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.
- E. Roof System: Preformed metal panels oriented parallel to eave, with sub-girt framing/anchorage assembly and insulation, and accessory components.
- F. Roof Slope: As noted on drawings

2.03 MATERIALS - FRAMING

- A. Select materials and material yield strengths based on building design requirements; use the following unless required otherwise.
 - 1. Structural Steel Plate, Bar, Sheet, and Strip for Use in Bolted and Welded Constructions: ASTM A 572 /A 570, A 529, ASTM A 607 with minimum yield strength of 50,000 psi.
 - 2. Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A 570, or A 607 with minimum yield strength of 55,000 psi.
 - 3. Galvanized Steel Sheet for Roll Formed or Press Broken Roof and Wall Coverings, Trim and Flashing: ASTM A 653, with minimum yield strength of 50,000 psi.
 - 4. Galvalume Steel Sheet Used in Roll Formed or Press Broken Roof Covering: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, with minimum yield strength of 50,000 psi; nominal coating weight of 0.5 oz per sq. ft both sides, equivalent to an approximate coating thickness of 0.0018 inch both sides.
 - 5. Hot Rolled Steel Shapes: W, M and S shapes, angles, rods, channels and other shapes; ASTM A 572/A 529/A 500 or ASTM A 36 as applicable; with minimum yield strengths required for the design.
 - 6. Structural Bolts and Nuts Used with Primary Framing: High strength, ASTM A 325 or A 490.

7. Bolts and Nuts Used with Secondary Framing Members: ASTM A 307.
8. Shop Coat: Manufacturer's standard rust inhibitive primer paint; manufacturer's standard color.
9. Pre-Painted Finish: 1 mil PVDF coating, minimum 70% Kynar 500 or Hylar 5000 on exterior surface.
 - a. Color: As selected from manufacturer's full line.
10. Interior finish: Off white 0.5 mil washcoat.
- B. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.04 ROOF AND WALL PANEL COMPONENTS

- A. Roof Panels: 'R' Panel; 36 inch wide net coverage, with 1 1/2" high major ribs at 12 inches on center with minor ribs spaced between the major ribs.
 1. Material: Galvanized steel, with G90/Z275 coating or Galvalume Steel, with AZ55 coating.
 2. Thickness: 26 gauge design base metal.
 3. Side laps: At least one full major rib, with a supporting member bearing edge on the lower panel and an anti-capillary groove on the upper panel. Factory applied sealant.
 4. Length: Continuous from eave to ridge up to 39 feet in length.
 5. Endlaps: 6 inches wide, located at a support member.
 6. Finish: Factory applied finish, PVDF coating, minimum 70% Kynar 500 or Hylar 5000, color as selected by Architect.
 7. Roof panels shall be factory-punched holes to match structural connections.
 8. The roof shall be tested and certified to meet UL uplift rating:
 - a. The design of the roof for this project shall meet UL 90 - UL design.
 9. Acceptable Product: Butler – Butlerib II Roof System.
- B. Wall Panels: Panel Rib; 36 inch wide net coverage, with 1 1/2" high major ribs at 12 inches on center with minor ribs spaced between the major ribs.
 1. Material: Galvanized steel, with G90/Z275 coating or Galvalume Steel, with AZ55 coating.
 2. Thickness: 24 gauge design base metal.
 3. Side laps: Two fully overlapping major ribs secured together with 1/4 inch diameter color-matched carbon steel fasteners.
 4. Length: Continuous from sill to eave up to 38 feet in length.
 5. Endlaps: 6 inches wide, located at a support member.
 6. Cut panels square at each end; provide base trim at sill.
 7. Finish: Factory applied finish, PVDF coating, minimum 70% Kynar 500 or Hylar 5000, color as selected by Architect.
- C. Soffit Panels: Architectural Soffit Panels; 12 inch wide net coverage, with two 6 inch wide flat surfaces in the same plane separated by a V-groove at 6 inches on center after adjacent panels have been installed.
 1. Material: Galvanized steel, with G90/Z275 coating or Galvalume Steel, with AZ55 coating.
 2. Thickness: 26 gauge design base metal.
 3. Finish: Factory applied finish, PVDF coating, minimum 70% Kynar 500 or Hylar 5000, color as selected by Architect.
 4. Side Joints: Factory applied gasket; tongue-in-groove connection with adjacent panels, with the connection reinforced by clips.
- D. Panel Fasteners:
 1. For Galvalume and factory applied finish roof panels: Stainless steel-capped carbon steel fasteners with integral sealing washer.
 2. For wall panels: Coated carbon steel.

3. Color of exposed fastener heads to match the wall panel finish.
4. Concealed Fasteners: Self-drilling type, of size as required.
5. Provide fasteners in quantities and location as required by the manufacturer.
- E. Flashing and Trim: Match material and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.
- F. Sealants, Mastics and Closures: Manufacturer's standard type.
 1. Provide at roof panel endlaps, sidelaps, rake, eave, transitions and accessories as required to provide a weather resistant roof system; use tape mastic or gunnable sealant at sidelaps and endlaps.
 2. Provide at wall panel rakes, eaves, transitions and accessories.
 3. Closures: Formed to match panel profiles; closed cell elastic material, manufacturer's standard color.
 4. Tape Mastic: Pre-formed butyl rubber-based, non-hardening, non-corrosive to metal; white or light gray.
 5. Sealant: Non-skinning synthetic elastomer based material; gray or bronze.
- G. Building Insulation System:
 1. System Components: Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components to for an insulation system as follows:
 - a. Thermal Resistance as required by 2015 IECC:
 - 1) Roofs: R-19 + R-11 LS.
 - 2) Walls: R-13 + R-6.5ci. or R-25 with 1/8" foam thermal break strips.
 - b. Batt Insulation: ASTM C 991 Type 1; preformed formaldehyde-free glass fiber.
 - 1) Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.
 - 2) Unfaced.
 - c. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as required to comply with 2015 IECC.
 - d. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as required to comply with 2015 IECC.
 - e. Vapor Barrier Liner Fabric: Syseal® type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
 - 1) Product complies with ASTM C 1136, Types I through Type VI.
 - 2) Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - 3) Flame/Smoke Properties:
 - (a) 25/50 in accordance with ASTM E 84.
 - (b) Self-extinguishes with field test using matches or butane lighter.
 - 4) Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
 - 5) Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - 6) Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
 - 7) Factory-folded to allow for rapid installation.
 - 8) Color: White
 - f. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.

- g. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick.
- h. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as Syseal® type liner fabric.
- i. Thermal Breaks:
 - 1) Thermal Blocks: 1 x 3-1/2 inch extruded polystyrene thermal spacer strips capped by 22 gage galvanized channels, with swagged end for interconnection along the purlin run, metal tabs at 2'-0" on center at clip locations, and pre-punched fastener holes.
- j. Straps:
 - 1) 100 KSI minimum yield tempered, high-tensile-strength steel.
 - 2) Size: Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
 - 3) Galvanized, primed, and painted to match specified finish color on the exposed side.
 - 4) Color: White
- k. Fasteners:
 - 1) For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - 2) For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
 - 3) For wood, concrete, other materials: As recommended by manufacturer.
- l. Wall Insulation Hangers: Fast-R preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

2.05 FABRICATION - FRAMING

- A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.
- B. Anchor Bolts: Formed with straight shank, assembled with template for casting into concrete.
- C. Provide framing for all roof openings.
- D. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.
- E. Shop Priming: Finish all structural steel members using one coat of manufacturer's standard shop coat, after cleaning of oil, dirt, loose scale and foreign matter.
 - 1. Finish primary frames with a minimum coating of 1.0 mil.
 - 2. Finish secondary structural with a minimum coating of 0.5 mil.

2.06 FABRICATION - GUTTERS AND DOWNSPOUTS

- A. Eave Gutters: Roll-formed 26 gage Galvanized or Galvalume steel sheet, with gutter straps, fasteners and joint sealant.
 - 1. Downspouts: 4 x 5 inches in 10 foot lengths, with downspout elbows and downspout straps. Provide expansion joints in gutters per SMACNA guidelines, 50'-0" o.c. max.
- B. Downspouts
 - 1. Downspouts shall be fabricated from 26 ga. Galvanized or Galvalume steel factory colored with PVDF coating, minimum 70% Kynar 500 or Hylar 5000, color as selected by Architect and shall have a minimum cross section area of 16 square inches.
 - 2. Downspout sleeve shall be furnished for attachment to the gutter. This attachment shall be made with 1/8" diameter stainless steel pop rivets and sealed with aluminized sealant.
 - 3. Downspout splices shall be lapped 2" and secured with 1/8" diameter stainless steel pop rivets.

4. A 45 degree elbow shall be provided at the base of all downspouts to direct the water flow away from the foundation for on-grade drainage. Refer to architectural drawings for details for below-grade drainage.
5. Downspouts shall return from the edge of eave canopies to the building wall.
6. Refer to architectural drawings for downspout steel boot requirements and connections.

2.07 ROOF ACCESSORIES

- A. Metal Building Manufacturer shall furnish or approve all roof accessories.
- B. Roof Curbs: Welded units fabricated for shingled installation with roof panels; minimum 18 gage Galvanized steel, with welds cleaned and treated with protective coating compatible with the Galvanized substrate.
 1. Top of curbs horizontal with 1-1/2 inch perimeter flange.
 2. Curb walls insulated with 1-1/2 inch, 3 pcf density rigid glass fiber insulation.
 3. Water Diversion: Integral 4 inch high by full length cricket on upslope side.
 4. Exposed curb flanges pre-drilled for correct fastener locations.
 5. Upslope and downslope curb flanges with integral welded inside and outside cell closures compatible with the roof panel profile.
 6. Curb Framing: Mounted on secondary structural members and installed from the top; compatible with the thermal expansion and contraction properties of the roof on which it is used.
 7. Opening Size: As indicated on drawings.
 8. Curbs for SSR Roof Panels: One-piece type.
 9. Finish: Factory applied finish, PVDF coating, minimum 70% Kynar 500 or Hylar 5000, color as selected by Architect.
- C. Pipe flashing shall consist of a molded rubber cone with an aluminum ring bonded to the base. Pipe flashing shall accommodate pipe diameter as specified and be capable of flashing penetration at any location of the roof panel. Flashing shall be sealed and fastened in accordance with manufacturer's drawings.
 1. Stack or pipe penetration shall be at the centerline of a major corrugation of the roof panel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

- A. Erect framing in accordance with AISC 360.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.
- C. Set column base plates with non-shrink grout to achieve full plate bearing.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.
- D. Provide expansion joints where indicated.
- E. Install sealant and gaskets, providing weather tight installation.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

- A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

- B. Apply bituminous paint on surfaces in contact with cementitious materials.

3.05 **INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM**

- A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.

3.06 **TOLERANCES**

- A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
- B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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. Coordinate the proposed routing of the main sprinkler lines with the Architect's drawings, including the reflected ceiling plans, and interior building elevations. Do not route the main sprinkler lines exposed unless indicated on the plans.

- C. 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.
- D. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.
- E. 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.
- F. 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.
- G. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.05 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.

1.06 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, 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 Division 01, Cutting and Patching.

1.07 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.

1.08 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.

1.09 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 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.

1.10 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 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, 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 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.

1.12 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 most current North America Free Trade Agreement. Any materials installed that are not manufactured in the United States and/or comply with NAFTA shall be removed and replaced at the contractor's time and expense, without exception. In addition, this removal and replacement shall not delay the project schedule.
- 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. Duties of certain equipment items, horsepower's 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 fire pump 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, fire pump, 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.

1.17 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 1300

COMBINED WET FIRE SPRINKLER AND STANDPIPE SYSTEM

PART 1 - GENERAL

1.01 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.

1.02 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 system and interior Fire Department valves in cabinets as shown on the Drawings, in locations as required by the Local AHJ and as approved by the Local authorities having jurisdiction for the new or renovated building.
- B. The Classification of Fire Department Valve/Standpipe System shall be as required by Local AHJ, Owner's Insurance Carrier and NFPA 14. Dry Roof Fire Department Connection shall be provided where required by Local AHJ.
- C. The extent of Fire Sprinkler piping work is not indicated by drawings and schedules. The successful Sub-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 backflow preventer, alarm check valves and trim, feed and cross main piping, branch line piping, test valves, test conditions and sprinklers, stainless steel backflow preventer assembly (type as required by Local AHJ) and inside Fire Department valve connections as required by local authorities. Fire Sprinklers and interior fire department valves (where required by the local AHJ) shall be installed to serve the entire Building Complex.
- D. A sprinkler layout is not shown on the plans. The successful Sub-Contractor shall prepare shop drawings for the hydraulically designed sprinkler system and secure approval of same from the Owner's Insurance Carrier, I.S.O. Commercial Risk Services Group representing the Texas State Insurance Authorities Review Board, and Local City Authorities. Approved plans and submittals shall be submitted to the Owner's Representative for approval before any materials are fabricated.
- E. The Sprinkler Systems shall be fed by one (1) sprinkler valve assemblies. The system shall be limited to a maximum of 52,000 square feet per floor in accordance with NFPA-13 and 14, and International Fire Code. The Sub-Contractor shall extend the sprinkler system piping to the property line or as shown on the drawings. Sub-Contractor shall coordinate with others to provide the City water tap.
- F. The Fire Department hose valves and standpipes (where required by local AHJ) shall meet the requirements of NFPA 14 as indicated and where required by the local Fire Department. The Fire Department valves shall be located in fire department hose valve cabinets and located in the stairwells. Cabinets shall be as specified herein and located per Architectural drawing. Provide fire department valve/standpipe classification as required by the local AHJ. The piping system shall be hydraulically calculated to include 500 gpm at 100 psig for a Class I standpipe system or 100 gpm at 65 psig for Class II standpipes in the most remote Fire Department valve location.

Piping system shall be designed to withstand the maximum booster water pressure and flowrate from the local fire department pumpers.

- G. 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.
- H. 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.
- I. The Contractor shall obtain, from the City, a water flow test as close as possible to the proposed building site. The test shall have been taken within the last six months and this information shall be used for the basis of design of the hydraulically calculated system.
- J. The sprinkler system shall be designated 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).
- K. In addition to the requirements of the governing authorities, the following design criteria shall be met:
 - 1. A 10 psig safety factor shall be designed into all the hydraulic calculations.
 - 2. The maximum velocity in the pipes shall not exceed 32 ft./sec.
 - 3. Head spacing shall not exceed 400 sq. ft. for light hazard areas and 130 sq. ft. for ordinary hazard areas such as mechanical rooms. Head spacing shall be further restricted by ceiling type where appropriate per NFPA-13. Extended coverage heads may be used only where noted.
 - 4. A main drain shall be provided next to the main sprinkler/standpipe riser.
 - 5. Floor openings shall be protected by closely spaced sprinkler heads in combination with draft stops as required by NFPA 13.

1.03 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. 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.
- D. FM Compliance: Comply with Factory Mutual "Approval Guide".
 - 1. FM approvals Marks: Provide units bearing FM approval marks.
- E. UL Labels: Provide units which have been approved and listed by Underwriter's Laboratories.
- F. Comply with NFPA Standards, Governing Fire Prevention Code, Local Regulations and Ordinances governing fire sprinkler piping.
- G. Coordinate with fire alarm installation for required monitoring of the sprinkler system.

- H. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA. Any materials installed that are not manufactured in the United States and/or comply with NAFTA shall be removed and replaced at the contractor's time and expense, without exception. In addition, this removal and replacement shall not delay the project schedule.

1.04 GOVERNING AUTHORITIES

- A. Each combined standpipe and 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 and NFPA-14.
- B. Comply with all requirements of the Owner's Insurance Carrier, and the City Authorities. Provide sprinkler products bearing approval from Underwriter's Laboratories.

1.05 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 Owner's Representative, and before installation work is started. Refer to Section 21 05 00 and appropriate Architectural section.
- B. Submit to the Owner's Representative, upon completion of each system, a certificate stating that the work has been completed and tested in accordance with NFPA-13, 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 Owner's Representative 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	
Jointing Method	X		

1.06 MAINTENANCE STOCK, FIRE SPRINKLERS

- A. Maintenance Stock: For each style and temperature range required, furnish an additional two (2) fire sprinklers, cover plates and escutcheons, for every 100 units installed, but not less than six (6) units of each type and twelve (12) concealed sprinkler covers of each type.

1.07 COORDINATION

- A. The Sub-Contractor shall examine all other work shown on the plans and such work installed at the job site. The sprinkler system Sub-Contractor shall coordinate the routing of his work with the 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 Sub-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.

- B. Coordinate routing of sprinkler piping and head locations in large volume spaces with architect's plans, including elevations. Routing of piping to be concealed where possible. Architect to review routing of mains piping and head locations in these spaces during shop drawing review.

1.08 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 00 00.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall comply with the requirements of NFPA-13 and 14, Owner's insurance carrier/ I.S.O. Commercial Risk Services Group, U.L., FM, and Section 21 05 00.

2.02 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.
- C. Above Grade, Indoor Piping 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. Pipe Size 1-1/2 Inch and Smaller: Class 150 malleable iron, threaded fittings, ANSI B16.3.
 - 2. Fittings: Acceptable manufacturers: Victaulic, Tyco, or Anvil.
- D. Above Grade, Indoor Piping 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. Size 2 Inch and Larger: UL listed mechanical grooved couplings with flush sealed gasket style equal to Victaulic "AWWA Flush Seal".
 - 2. Fittings: 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.

2.03 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.

2.04 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 CV-1FR.
- D. Sectional Valves: Provide indicating butterfly control valve, BFV-N, 175 LB rated working pressure, of size and end types indicated: 2-1/2" and larger: Tyco or Victaulic “FireLok” 705 Series.

2.05 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 manufacturer’s: Tyco, Reliable or Viking.
- B. 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 without ceilings equal to Tyco TY-FRB. Sprinkler Finish: Cast brass (in non-exposed areas) and chrome plated (in occupied areas).
- C. Emergency Head Storage Cabinet: Provide a red, baked enamel, steel sprinkler cabinet to store the extra sprinklers, wrenches, list of installed sprinklers with Sprinkler Identification Numbers (SIN) in addition to requirements of NFPA-13.
- D. Provide cage guards for sprinkler head in the warehouse. Cage guards shall be UL listed and engineered products equal to SprinkGuard products.

2.06 ACCESSORIES

- A. Tamper Switches: Provide tamper switches equal to Potter Type OSYSU or PCVS Series on all control valves for connection to the fire alarm system.
- B. Water Flow Detectors: Provide a water flow detector equal to Potter Type VSR Series 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, Potter-Roemer No. 6240 pressure gauges 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 weatherproof, red finished, 120V exterior horn/strobe UL listed FM approval with back box equal to Potter SH-120 Series.

- E. Ball Drips: Provide 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. 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.
- G. 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.
- 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 letters "AUTO.SPRK". Entire unit shall have polished chrome finish, size shall be 2-1/2" x 2-1/2" x 4" with Knox Cap. Provide "Storz" connection as required by local Fire Department equal by Guardian Fire Equipment or Croker.
- J. Double Check Backflow Preventer Assembly:
 - 1. Acceptable manufacturers:
 - a. Watts.
 - b. Apollo.
 - c. Ames.
 - 2. Double check valve type with shutoff valves.
 - a. Indicating Butterfly shut-off valves 3 inches and over.
 - 3. Stainless Steel construction 3 inches and over with stainless steel internal.
 - 4. Provide in-line upstream y-type strainer.
 - a. 0.125 perforated screen mesh 2-1/2 inches and over.
 - 5. Acceptable Product: Ames "Maxim" M300BFG.

2.07 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 or MDF Rooms.
- C. Only the branch line serving that specific Electrical Room, IDF or MDF Room shall enter that specific room.

2.08 FIRE DEPARTMENT VALVE AND CABINET

- A. Valves: Potter-Roemer 4500 Series 1700 U.L. rough brass 175 psig fire line angle valve with malleable iron handles, 2-1/2" x 2-1/2" with 1-1/2" reducer, Potter-Roemer 4600 Series 120 rough brass pin lug with threads suitable for connection of local fire department hoses.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install combined standpipe and automatic sprinkler system where shown on the Drawings or as noted. Installation shall comply with the requirements of NFPA-13 and NFPA-14, Local Fire Code, 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 and 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. 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.
- E. Install sectional valves in inlet piping at the bottom of each riser and in loops as indicated or required.
- F. Install air vents at the high points of the sprinkler piping.
- G. Install a tamper switch on hose connection cabinet door, each sectional valve and on each other shut-off valve.
- H. Install drain piping at all low points of the sprinkler piping.
- I. Thrust blocks shall be of size required for the soil bearing strength and against compacted soil.
- J. Install water flow detectors at each take-off from a sprinkler riser or for each zone.
- K. Install pressure reducing valves as required by NFPA 13.
- L. Install heads in all locations, pendant or upright, as required to provide complete coverage. Sprinkler shall be strictly coordinated with diffusers, grills, lights, ceiling type, and other trades.
- M. 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.
- N. NO MECHANICAL TEES SHALL BE INSTALLED.

3.02 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 Owner's Representative from NFPA's suggested styles.

3.03 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.

3.04 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.

3.05 CERTIFICATION

- A. Before final approval of the fire protection systems are requested, provide the Owner's Representative 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 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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.

1.05 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.

1.06 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.
- 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.

1.07 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.

1.08 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.

1.09 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 most current North America Free Trade Agreement. Any materials installed that are not manufactured in the United States and/or comply with NAFTA shall be removed and replaced at the contractor's time and expense, without exception. In addition, this removal and replacement shall not delay the project schedule.
- 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 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, horsepower 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 pump motor 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, water heaters having a different power voltage, phase or breaker size than those on which the heater were based, the Contractor shall be responsible for 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 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.

1.17 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.

1.18 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.

1.19 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 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.

1.20 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 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.

1.22 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.

1.23 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.

1.24 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 0553

IDENTIFICATION FOR PLUMBING EQUIPMENT AND PIPING

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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.

1.05 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

2.01 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. Sprinkler Piping (Red background)
 - 3. Natural Gas (Yellow background)

2.02 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.

2.03 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

3.01 PIPE MARKER INSTALLATION

- A. Provide flow arrows at each marker location.
- B. Markers shall be spaced not more than 15 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.

3.02 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.

3.03 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 0700

PLUMBING INSULATION

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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.

1.05 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

2.01 PIPING AND EQUIPMENT INSULATION MATERIALS

A. Domestic Cold Supply 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 PIPE SIZES				
	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

PART 3 - EXECUTION

3.01 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.

3.02 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 1116

DOMESTIC WATER PIPING SYSTEM

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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. Hose bibbs.
 - 6. Hydrants.
- 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.

1.04 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. International Plumbing Code.
- B. Installer shall have been doing related work as described herein for a minimum of 5 years.
- C. When CPVC is used, all installers must be trained by representative as provided by the manufacturer of the material. This training must be documented.

1. Acceptable Manufacturers:
 - a. Charlotte Pipe.
 - b. Nibco Inc.
 - c. Crestline Plastic Pipe Co.
 - d. IPEX.
 - e. Harvel.
- D. When CPVC is used, all materials to come into contact with CPVC must be approved for use by the manufacturer of the CPVC material. Examples are solvent cements, fire stops, thread sealants, and leak detectors.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Above ground:
 1. 2 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.
 - 2) Over 4 inch up to 6 inch, cast brass or 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. Fitting (Alternative - ProPress)
 - 1) 3" and smaller, wrought copper. Press fittings, or ASME 16.2.2, ASME 16.18 sealing with EPDM sealing element for 1/2" to 2" and ProPress XL for 2-1/2" to 3.
 - B. Underground 5'-0" beyond exterior of building:
 1. 3 Inch and Smaller:
 - a. Piping: Hard drawn or annealed copper tube, ASTM B88, Type K.
 - b. Fittings: Wrought copper solder joint fittings, ANSI B16.22
 - c. Joint solder: "Silfos" only, no lead containing solder allowed.
 - C. Underground piping within 5'-0" exterior of building:
 1. 2 Inch and Below:
 - a. Pipe: Annealed copper coils, ASTM B88, Type K.
 - b. Fittings: No fittings allowed below slab.
 - D. Optional piping when approved by Local Authorities having jurisdiction. Underground 5'-0" beyond exterior of building:
 1. 3 Inch and Smaller:
 - a. Piping: Polyvinyl Chloride (PVC) pipe; ASTM D1784 and ASTM D1785 or ASTM 2241. NSF stamped and approved for potable water system and rated for 200 psi minimum pressure.

- b. Fittings: Schedule 40 PVC ASTM D2466 NFS stamped and approved for potable water system. Fittings shall be rated for 250 psi working pressure.
- E. Unions:
 - 1. 2 Inch and Smaller: ANSI B16.22 wrought copper; solder end fittings.
- F. Valves and Supports: Provide lead-free bronze full-port ball valves with stainless steel trim for pipe sizes 2-1/2" and smaller. Butterfly valve are not allowed. Refer to Section 22 05 00 and 22 21 13, Basic Materials and Methods.

2.02 SPECIALTIES

- A. Vacuum Breakers:
 - 1. Acceptable manufacturer:
 - a. Watts.
 - b. Febco.
 - c. Apollo.
 - 2. Atmospheric, check valve type.
 - 3. Bronze body construction with polished chrome finish.
- B. Hose Bibbs Within Mechanical Rooms or Unfinished Building Space: 3/4" chrome plated brass compressed cocks; hose connection; key handle, lock shield, vacuum breaker; Chicago No. 998 or No. 952, as required; or equivalent by T&S Brass or Woodford.
- C. Wall Hydrants - Exposed Non-Freeze Wall Hydrant with Integral Vacuum Breaker: Josam #71000-74-95 cast bronze hydrant with satin nickaloy scoriated with cylinder vandalproof lock face, integral backflow preventer. "T" handle key, and bronze casing with 3/4" universal inlet connection.

PART 3 - EXECUTION

3.01 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. Coordinate routing of domestic water piping routing locations in large volume spaces with architects plans, including elevations. Routing of piping to be concealed where possible. Architect to review routing of piping in these spaces during shop drawing review.
- I. Strictly coordinate locations of wall clean out cover plates and access doors. Submit locations to the Architect prior to installation for final approval.

3.02 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.

3.03 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 1123

NATURAL GAS PIPING SYSTEM

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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. International Plumbing Code and Fuel 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

2.01 MASTER METER

- A. Contractor shall coordinate new gas service requirements with the Local Natural Gas Utility Company to insure the timely provision of this service to keep up with the project requirements. Coordinate exact pipe routing, size, installation, and system pressure requirements with utility company. Contractor shall coordinate with and pay all costs to the Utility Company for all new gas piping from the off-site gas main trunk connection up to the property line, extended onto the site up to and including the gas meter installation at the proposed location. Contractor shall install gas piping from the gas meter up to the building entry point. This system shall be provided with the service pressure noted with isolation valves, test ports, and regulation components to adjust the downstream pressure to that indicated.
- B. Contractor shall furnish to the local gas utility company a detailed itemized list of all gas fired equipment including required operating supply pressure and MBTU input requirement of each piece of equipment.

2.02 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.

2.03 UNDER GROUND PIPE AND FITTINGS BEYOND THE BUILDING EXTERIOR

- A. Polyethylene Pipe: ASTM D2513, D2683, and D3261, Type PE 2306; SDR 9.3 through 21.
- B. Fittings: Socket and butt type, thermally bonded.
- C. Joints: Thermally bonded heat fusion joints.

- D. Tracer Wire: Seton underground gas line warning tape, yellow color with "Caution - Gas Line Buried Below" continuously labeled, minimum 0.004 inch thick polyethylene, with metallic core, two inches wide.
- E. Service Riser: Schedule 40 pre-bent galvanized steel riser with transition and protective coating and anode as detailed on the Drawings. Provide anodeless service riser where required by Local Authorities.

2.04 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.

2.05 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.

PART 3 - EXECUTION

3.01 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. Where gas burning kitchen equipment is located adjacent to other gas burning kitchen equipment, provide manifold for battery.
 - 4. Connect each end of a manifold to gas distribution system to maintain uniform gas pressure at each piece of equipment, two (2) point service.
 - 5. 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. Place fire stop where pipes pass through fire walls, fire partitions, or floors.
- J. Sleeves:
 - 1. Vent all sleeves to the outside. Terminate sleeve to prevent entrance of water and insects.
 - 2. Terminate gas sleeve vents a minimum of twelve inches (12") above grade with specified vent cap. All exposed vent piping on roof or above grade shall be Schedule 40 galvanized steel pipe.
 - 3. Vent to have free area equal to the net free area between the sleeve and the largest gas pipe contained therein.

4. Where the end sealing is capable of withstanding the full pressure of the gas pipe the vented sleeve shall be designed for the same pressure as the pipe.

K. Underground Pipe Coatings: Refer to Section 22 05 00 and Local Gas Codes.

3.02 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 2113

PLUMBING PIPING SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 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. Any materials installed that are not manufactured in the United States and/or comply with NAFTA shall be removed and replaced at the contractor's time and expense, without exception. In addition, this removal and replacement shall not delay the project schedule.

1.03 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.

1.04 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".
- 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.

1.05 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

2.01 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.

2.02 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.

2.03 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.

2.04 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. 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.
- J. 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.
- K. Bronze Lead-Free Ball valves: 2" and Smaller:
1. Ball valves shall be on the following products:
 - a. Nibco T-685-80-LF or S-685-80-LF.
 - b. Apollo 77CLF 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.

2.05 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, Polypropylene pipe sizes 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 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.

2.06 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.

2.07 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.

PART 3 - EXECUTION

3.01 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 Thredolets; 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. Miterring 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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.

3.08 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.

3.09 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 23 0000

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) WORK

PART 1 - GENERAL

1.01 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.
 - 3. Operation and Maintenance of all HVAC 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. Refer to Specification Section 01 32 16 for "Construction Progress Schedule".

1.02 RELATED DOCUMENTATION

- A. Section 01 60 00: Product Requirements.
- B. Section 01 70 00: Execution and Closeout Requirements.
- C. Section 01 78 00: Closeout Submittals.

1.03 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 - EXECUTION

NOT USED

PART 3 - EXECUTION

3.01 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; and automatic temperature controls.
- 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.

3.02 SCHEDULE OF WORK

- A. Reference Division 1 for Additional Scheduling Information.
- B. 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.

- C. 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.

3.03 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 0500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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 00, Closeout Submittals.

1.08 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 00 & 01 700 00:
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.

1.09 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 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.
- 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, horsepower 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 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.

1.17 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 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 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 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 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 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.

1.22 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.

1.23 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.

1.24 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 0513

COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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

2.01 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. Motor manufacturers shall be Reliance, Baldor, General Electric, A.O. Smith or U.S. Motors. Other manufacturers will not be considered.

PART 3 - EXECUTION

3.01 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 0514

COMMON MOTOR STARTER REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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

2.01 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. Cutler-Hammer.
 - 3. Square D.

PART 3 - EXECUTION

3.01 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 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 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.

1.02 SYSTEM DESCRIPTION

- A. A complete system of vibration isolation for all mechanical equipment subject to the transmission of noise and vibration to the building.

1.03 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.

1.04 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.

1.05 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

2.01 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.

2.02 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. Equipment to be installed on housekeeping pads shall be mounted on ribbed neoprene pads equal to Amber Booth Ampad Type NR or NRC, Style B isolators.

2.03 MANUFACTURER

- A. Isolating material used shall be equivalent to Amber-Booth, Peabody, Korfund Vibration Mountings, or Mason.

PART 3 - EXECUTION

3.01 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 0553

IDENTIFICATION FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 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.

1.02 SYSTEM DESCRIPTION

- A. Provide a complete system of equipment identification tags as described herein.

1.03 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 equipment name plates shall be a product of Seton Name Plate Corporation, EMED Company, Inc., or Craftmark Identification to meet all ANSI Standards pertaining thereto.

1.04 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 equipment to receive identification tags, cut sheets and proof copies of tags which indicate location of tag and wording to be engraved thereon.

1.05 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

2.01 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/Ventilaion Air Fans.
 - 2. Gas and Electric Unit Heaters.
- 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

3.01 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 0593

TESTING, ADJUSTING, AND BALANCING (TAB) FOR HVAC

PART 1 - GENERAL

1.01 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.

1.02 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 for directly by District. District shall select the TAB firm 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 moving equipment.
 - 2. Heating systems.
 - 3. 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.

1.03 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.).
 - c. Verify that all supply, return, exhaust and transfer air diffusers, grilles and registers are installed as indicated on the mechanical Drawings.
 - d. Verify that all (exhaust) fans are operational including proper fan rotation, operates free from vibrations, belts are properly aligned, and belt tension is proper.
 - e. 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.
 - f. Make a record of actual motor amperage and voltage, per phase, and verify that they do not exceed nameplate ratings.
 - g. Verify specified vibration isolation accessories are correctly installed and adjusted.
 - h. 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.

1.04 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. 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).
 - b. Heating Coils or heat exchangers:
 - 1) Verify that all piping connections and accessories are installed per the design documents, as applicable.
 - 2) Verify that all coils and heat exchangers are installed properly.
 - 3) Verify correct overload devices are installed for electric heating devices.
 - 4) Verify operation of all safety devices.
 - 5) 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 and 2.0 percent for relative humidity 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.

1.05 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. 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).
 5. Coils or Heat Exchangers:
 - 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.
 - e. Design and actual leaving air dry bulb temperatures.
 - f. Actual outside air temperature, dry and wet bulb, during testing.
- 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 0700

INSULATION

PART 1 - GENERAL

1.01 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.

1.02 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 equipment identification systems as specified in Section 23 05 53.

1.03 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.

1.04 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.

1.05 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

2.01 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.

2.02 DUCTWORK INSULATION MATERIALS

A. 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

3.01 GENERAL

- A. 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.
- B. 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

- C. Unsightly work shall be cause for rejection, including poor application of adhesives and coatings beyond the insulation which coats valves or other piping specialties.
- D. 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.

- E. 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.
- F. 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.
- G. 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.
- H. The following describes materials, thickness and finishes for insulation on piping and ductwork. 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.
- I. 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.

3.02 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 louver of all rectangular low pressure outside air ducts 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.

END OF SECTION

SECTION 23 0800

MECHANICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.01 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.

1.02 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: electric unit heaters, gas fired unit heaters, exhaust 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.

1.03 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. Commissioning Services shall be paid for directly by District. 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.

1.04 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.

1.05 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 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.
 - l. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot-checking.
 - m. Approve systems startup by reviewing start-up reports and by selected site observation.

- n. 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.
 - o. Analyze any functional performance trend logs and monitoring data to verify performance.
 - p. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
 - q. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
 - r. Oversee and approve the training of the Owner's operating personnel.
 - s. Compile and maintain a commissioning record and building systems book(s).
 - t. Review and approve the preparation of the O&M and Systems manuals.
 - u. 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.

1.06 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

2.01 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

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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 is completed and debugged before functional testing of air-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.

3.06 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.

3.07 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. Dampers and damper actuators.
 - h. 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.

3.08 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 heating equipment, fans, and controls.
 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.

<u>Hours</u>	<u>System</u>
<u>4</u>	Exhaust Fans and Unit Heaters

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 8 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 8 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.

3.09 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 0900

CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and all referenced documents.
- B. Comply with Sections 23 00 00 and 23 05 00, General Provisions, and all other Division 23 Sections, as applicable.
- C. Refer to other Divisions for coordination of work with other trades.

1.02 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; 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, dampers, 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 by an IBM compatible Workstation (not provided under this contract) and off site by a Central Work Station located at the Facilities Central Maintenance Office Service Center via Ethernet LAN. 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 Reliable (Enviromatic Systems).

1.03 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.
- 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 (both EMS system, Enviromatics, and equipment controls, Trane or Lennox) 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 of the system for a minimum of four (4) hours for the basic Controls System and eight (8) 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 either native "ASHRAE BACNET" and shall communicate with all other BACNET 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 these systems.

1.04 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 (for main EMS system and equipment controls).
- 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.

1.05 SUBMITTALS

- A. Submittals shall be complete and be in full accordance with Section 23 05 00, Common Work for HVAC.
- 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. Three (3) sets of Blue or Black line prints of "As-Built" drawings, half size (11" X 17"), inserted in a three ring binder.
2. Three (3) 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 or thumb drives with all the information indicated above for items 1, 2, 3 and 4 in PDF format.

1.06 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.

1.07 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.

PART 2 - PRODUCTS

2.01 TEMPERATURE SENSORS

- A. Temperature sensors shall be nickel wire thermistor, 10,000 or 20,000 ohm resistance, or RTD Type, 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. Furnish sensors with maximum 6 to 9 inch insulated pigtail leads or trim sensor pigtail leads to meet this criteria once installed.
- E. All sensor actions shall be the same for the entire building.

- F. 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.
- G. 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.
 - 3. Local override pushbutton to energize controlled equipment.
 - 4. Local operator interface communication service jack compatible with mobile trouble shooting terminal unit. Alternately, provide spare service jack on terminal equipment controller on controlled terminal equipment.
- H. Sensors shall be as manufactured by Reliable, Trane, or Lennox.

2.02 AUTOMATIC DAMPERS

- A. Provide all control dampers, under this Section of the Specifications, of the types and sizes indicated on the Drawings, including but not limited to outside air intakes, return, relief, and other motorized air control dampers where shown, or where not an integral part of the equipment furnished and specified in other sections of these specifications. All dampers shall be special low leakage extended performance type.
- B. Damper frames shall be not less than 16 gauge galvanized steel formed for extra strength with mounting holes for flange and enclosed duct mounting.
- C. Dampers shall be available in two-inch size increments from 8" horizontal and vertical to 48". Requirements for dampers over 48" in size shall be met by using standard modules with interconnecting hardware to limit damper blade length to a maximum of 48". Provide separate actuator for damper modules exceeding 32.0 square feet and as required for smaller sizes due to torque requirements.
- D. All damper blades shall be not less than 16 gauge galvanized steel roll formed for high velocity performance. Blades on all dampers must be not over 6" wide.
- E. Blade bearings shall be nylon or oilite with 1/2" zinc plated steel shafts.
- F. All blade linkage hardware shall be of corrosion-resistant finish and readily accessible for maintenance after installation.
- G. Provide continuous replaceable neoprene or butyl rubber edging seals for all outdoor and relief air dampers where blade edges meet when dampers are closed. Spring loaded stainless steel side jamb seals shall be provided for all dampers.
- H. Dampers and seals shall be suitable for temperature ranges of -20 degrees F to 200 degrees F at specified leakage ratings.
- I. Dampers used for proportional control shall have opposed blades.
- J. Leakage rates for all controlled dampers shall not exceed 5 CFM of air flow per square foot of face area based on a 16 square foot damper, at 1.0" W.C. differential, rated in accordance with AMCA 500. Furnish test data with submittals.
- K. Acceptable manufacturers (No other manufacturers will be allowed):
 - 1. Johnson Controls, Inc.
 - 2. Honeywell, Inc.
 - 3. American Warming and Ventilating, Inc.
 - 4. Ruskin.
 - 5. Nailor Industries, Inc.

2.03 ELECTRIC DAMPER ACTUATORS

- A. All control dampers shall receive electric actuators.
- B. Electronic direct-coupled actuation devices shall be provided.
- C. Electric Actuators shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and to eliminate slippage.
- D. Spring return actuators shall have a "V" clamp assembly of sufficient size to be directly mounted to an integral jack shaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or set screw type fasteners are not acceptable.
- E. Actuators shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
- F. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable. This applies to all dampers directly connected to outside and relief air systems. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
- G. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control input and provide a 2 to 10 VDC or 4 to 20 mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. Floating point type control is acceptable on fan coil units, unit heaters and variable air volume terminals. All actuators shall provide for a 2 to 10 VDC position feedback signal although not used at this time. However, software feedback will be used at this time.
- H. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120 VAC power shall not require more than 10 VA.
- I. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper or valve when the actuator is not powered. Spring return actuators with more than 60 in-lb torque capacity shall have a manual crank for this purpose.
- J. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation. Modulating actuators shall be compatible with the PWM output of the direct digital controllers.
- K. Actuators shall be provided with a conduit fitting and a minimum three-foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
- L. Actuators shall be Underwriters Laboratories Standard 873 listed.
- M. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a minimum 2-year manufacturer's warranty, starting from the date of Substantial Completion.
- N. All actuators connected to all sequenced dampers shall have independent control and adjustment from one another to emulate a pilot positioner.

O. Acceptable Manufacturer's:

1. Belimo.
2. Honeywell, Inc.
3. Johnson Controls, Inc.
4. Siemens.
5. Honeywell, Inc.

2.04 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.

2.05 ROOM SENSOR AND THERMOSTAT PROTECTIVE COVERS

- A. Provide opaque Lexan thermostat guards with mounting brackets and tamper proof screws for each new wall mounted temperature, relative humidity and carbon dioxide sensors and thermostats installed, as indicated herein. Administrative office areas and classrooms shall not require guards. Generally, guards shall be provided in Institutional Public Use Areas such as Cafeterias and Public Use Corridors unless noted otherwise.
- B. Painted metal, steel, cast aluminum or cast iron guards, shall be used in high abuse areas such as gymnasiums and locker rooms, without exception.
- C. Guards shall be sized to accommodate the thermostat or sensor to be enclosed, and include ventilation openings, ring base, and key lock.
- D. Guards shall be as manufactured by:
 1. Beko.
 2. Honeywell.
 3. Mars.

2.06 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, pre-piped, and 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 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. 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.
- J. All wiring inside panels shall be concealed in a wiring harness.
- K. Permanently affix inside each panel a final "as-built" control drawing of the piping and wiring of the panel.
- L. All panels shall be factory assembled, piped and wired and include a key cylinderlock. All locks shall use the same master key.

2.07 ENERGY MANAGEMENT SYSTEM

- A. 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.
- B. 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.
- C. 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 controlled exhaust fans over 2000 CFM in capacity. Alternately, provide this capability integral with the Direct Digital Controllers. Terminal units such as small exhaust fans, 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:

$$WB = (DB-DP)K+DP \text{ where } K = 0.560-0.0068 (DP-30)$$

9. An operator shall be able to define the minimum time delay between the stopping of a piece of equipment and its subsequent restart. This time delay shall be in effect for motors in the software control mode and for EMS controlled motors in the "manual" control mode. Provide equipment fail restart software that will restart equipment shut down as the result of a fire alarm system, power outage or other building wide shut-down, following the return to normal conditions. This shall consist of designated groups of RTU's and other EMS controlled equipment being rearterted at staggered time intervals to prevent excessive demand on the power supply.

D. 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.

E. 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.

- F. 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.
- G. 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.

- H. 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.
- I. Associated Hardware:
 - 1. All actuators for 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.
- J. 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.
- K. 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 locally display an alarm as well as 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.
- L. 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.
- M. U. L. Approval: The DDC system panels shall be an approved U.L. System, with U. L. listing as a Signaling System.
- N. 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. Provisions shall be made for on-line programming and override.
- O. On/Off Points of System Control shall be provided for the following:
 - 1. Exhaust Fans: EF-1-6 (Status only)
- P. 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. Coordinate the means of status with all equipment furnished.
- Q. Failure Alarm Status for the following EMS controlled items shall be provided through the EMS:
 - 1. Combined Safety Alarm, one (1) for each EMS controlled fan.
 - 2. Low/High Temperature Alarms for each temperature sensor installed, four (4) Deg.F. above or below set point, adjustable.
- R. Provide cumulative run time logging and indication for equipment noted in Paragraph "R", above.
- S. Provide analog indication for the following:
 - 1. Provide indication of outside air temperature in Deg.F for this building.
 - 2. Provide indication of outside air relative humidity in % R.H. for this building.
 - 3. Space Temperature, Degrees F.:
 - a. Fire riser Room.
 - 4. Electric Service Meter demand KW and Consumption in KWH. Provide metering device and installation under this specification section. Meter shall be equal to E-Mon or D-Mon type and shall be 208/3 type. Meter shall have BacNET IP or MS/TP interface or ModBUS communication capability and be able to measure and communicate to the EMS system amperage and voltage for each phase and associated kW, kWh and power factor. Energy Management System shall graphically show the instantaneous kW and kWh for each meter.
- T. Provide communication interface between EMS System and the following equipment:
 - 1. Lighting Control System (Interior and Exterior).
- U. 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 the highest Baud Rate reasonably possible.
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, set points 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.
- V. For all above ceiling or roof mounted equipment with controllers not mounted on or in the units, the EMS controllers should be mounted directly above the ceiling where the space temperature sensor is located.

2.08 DATA SERVERS, WEB SERVERS, DDC SYSTEM SERVERS AND WORKSTATIONS

A. Hardware Requirements:

1. The following minimum requirements apply to system servers, data server, web server and operator workstations:
 - a. 3 GHz Clock Speed Pentium 4 processor with 1 GB of RAM.
 - b. Serial port, parallel port and 4 USB ports.
 - c. 10/100 MBS Ethernet NIC.
 - d. 500 GB minimum Hard Disk.
 - e. DVD-RW drive (minimum 56X) CD ROM.
 - f. High resolution (minimum 1280 by 1024), 17 inch flat panel display.
 - g. Optical mouse and full function keyboard.
 - h. Audio sound card and compatible speakers.

B. Software requirements:

1. General: The following software with license agreements shall be provided.
 - a. System Servers:
 - 1) Microsoft Windows Server.
 - 2) Microsoft Office Professional Edition, latest edition.
 - 3) DDC System Server Application, latest revision.
 - 4) Any other software required to deliver the specified performance.
 - b. Data Servers:
 - 1) Microsoft Windows Server Operating System, current edition.
 - 2) Microsoft Sequel, latest edition (It is important that your data server be equipped with what is referred to as "Full Sequel" and not one of the reduced capacity versions such as "Microsoft Sequel Desktop Engine (MSDE)". Data collection and analysis is an important feature of DDC systems, and reducing your ability to collect and store long term data is not worth the small savings achieved by the purchase of a reduced capability software package.)
 - 3) Microsoft Office Professional Edition, latest edition.
 - c. Web Server:
 - 1) Microsoft Windows Server Operating System, current edition.
 - 2) Microsoft Office Professional Edition, latest edition.
 - 3) DDC System Web Server Application, latest revision.
 - 4) Any other software required to deliver the specified performance.
 - d. Operator Workstations:
 - 1) Microsoft Windows XP Professional Operating System, current edition.
 - 2) Microsoft Office Professional Edition, latest edition.
 - 3) DDC System Operator Workstation Application(s), latest revision.

- 4) Any other software required to deliver the specified performance.

C. Graphics Interface Pages

1. Graphic Pages:

a. Hierarchy:

- 1) The organization of graphic pages shall be from a global level down to a very detailed level through a series of links.
- 2) Linking shall allow the operator to move down the hierarchy, up the hierarchy and laterally within the hierarchy.

b. Hierarchy Outline:

- 1) Site Plan Page: A visual representation of the site (map). One page or multiple linked pages depending on the size of the site plan.
 - a) Link to individual building graphic pages.
 - b) Display outdoor weather conditions.
- 2) Utility Management Page: A summary of data on the utility consumption for the site.
 - a) Link up to the site plan.
 - b) Display:
 - (1) Utility consumption data.
 - (2) Demand data.
 - (3) Voltages, currents and power factors.
 - (4) Demand control actions currently in effect.
 - c) Presenting the utility management data may require more than one graphic page to effectively report the data from multiple meters.
- 3) Building Graphic Page: Typically a picture of the building. One page per building.
 - a) Link to floor plans within building.
 - b) Link to central plant graphics where the plant serves the entire building.
 - c) Link to delivery systems if the delivery system serves the entire building.
 - d) Link up to the site plan.
- 4) Floor Plan Page: This will be a two dimensional plan of a floor area. A minimum of one page per floor per building is required. Where floor plans are large, multiple linked pages are required. For each control zone the value of the controlled parameters shall be displayed. This will typically be lighting status, temperature and relative humidity if relative humidity is a controlled variable.
 - a) Link up to the Building page.
 - b) Link up to the Site Plan page.
 - c) Link to any delivery system that serves the floor plan area (air handling unit is typical).
 - d) Link to time schedule that affect the systems that serve the area.
 - e) Link to Terminal Unit Summary page where multiple zones on the floor are served by unitary control devices.
 - f) Individual control zones shall be identified.
 - g) The location of terminal equipment serving each zone shall be shown.
 - h) The location of sensors installed in the occupied space shall be shown.
 - i) Where room numbers are available, they shall be shown. Revise room numbers in graphics to match the actual room numbers selected and

- installed in the facility; if not matched to construction drawing room numbers.
- 5) Delivery System Page: A graphical representation of an air delivery system such as a D/X air handling unit, 100% outside air unit. One page for each delivery system.
- a) If the Delivery System serves a specific floor area, link up to the Floor Area page.
 - b) Link up to the Building page.
 - c) Link up to the Site Plan page.
 - d) If the Delivery System supplies multiple terminal devices, link to a Terminal Unit Summary page.
 - e) Link to a Delivery System Configuration page.
 - f) The graphical representation of the equipment shall be 3- dimensional and represent the true physical characteristics of the installed system.
 - g) Display:
 - (1) Process variables.
 - (2) Commands to end devices.
 - (3) Status of end devices.
 - (4) Status of different modes (economizer on/off, mechanical cooling enabled/disabled, occupied/unoccupied).
 - (5) Alarm points.
 - h) Link to any time schedules that affect the system operation.
 - i) Link to any pre-configured trend charts for the system.
- 6) Delivery System Configuration Page: On this page the operator is given access to the configuration parameters for the delivery system. Typically, this page presents data in a tabular format. The type of data on this page is not changed frequently, but the operator may wish to view it frequently. One page per delivery system is required.
- a) Display.
 - (1) Set Points.
 - (2) Turning Parameters.
 - (3) Calibration Parameters.
 - (4) Timing Parameters.
 - (5) Application Parameters.
 - (6) Reset Schedules.
 - (7) Lead Lag Information.
 - (8) Time Schedules.
 - b) Link up to the Delivery System page.
 - c) Link up to the Building page.
 - d) Link up to the Site Plan page.
- 7) Terminal Equipment Summary Page: On this page the dynamic data and set points that are associated with multiple terminal units are presented in a tabular format. The objective is to present a summary of terminal unit performance for an area of the facility. One page is required for each group of terminal units. In the tabular data, do not use less than 12 pt. font size. Multiple linked pages may be used if there are a large number of terminals served by one delivery system.
- a) Display in the table:
 - (1) Process variables.
 - (2) Set points for each process.
 - (3) Command to each end device.

- (4) Status of each end device.
 - b) Link to the page for each Terminal Unit.
 - c) Link up to the Delivery System page.
 - d) Link up to the Floor Plan page.
 - e) Link up to the Building page.
 - f) Link up to the Site Plan page.
- 8) Terminal Unit Page: A graphical representation of a terminal unit such as a D A/C unit and 100% outside air unit. One page for each terminal unit.
 - a) Link up to the Terminal Summary page.
 - b) Link up to the Floor Plan page.
 - c) Link up to the Building page.
 - d) Link up to the Site Plan page.
 - e) The graphic representation of the equipment shall be 3- dimensional and shall represent the actual installed terminal unit.
 - f) Display:
 - (1) Process variables.
 - (2) Command to end devices.
 - (3) Status of end devices.
 - (4) Set points for each process.
 - (5) Modes (auto, heat, cool, etc.).
 - (6) Capacity indicators (terminal load, % heat, % cool, etc.).
 - (7) Reset schedules.
 - (8) Occupancy commands and status.
 - (9) Alarm points.
- c. For all points on a graphic page that are subject to being under manual or test mode, the display shall indicate when test mode or manual mode has been applied to the point.
- d. Graphic Page Requirements:
 - 1) The sequence of control defines the buildings and all of the equipment items for which graphic pages shall be constructed as described above.
 - 2) The Contractor shall develop similar additional graphic pages to be defined during the construction period as follows:
 - a) Up to five additional pages per building.
 - b) Up to twenty additional global pages.
- e. Graphics and central zone grouping of units and systems shall be as follows:
 - 1) Zone 1 - Unit 'A' - Admin., Cafeteria, Gym.
 - 2) Zone 2 - Unit 'B' - Classrooms.
 - 3) Zone 3 - Unit 'C' - Classrooms.
 - 4) Zone 4 - Unit 'D' - Classrooms.
- f. User Access:
 - 1) User Groups:
 - a) The Contractor shall configure four user groups, one for each level of security. The group names shall be representative of the "names" below:
 - (1) Administrators.
 - (2) Engineers.
 - (3) Operators.
 - (4) Viewers.
 - 2) Users:

- a) The Contractor shall configure two users in each group. The name and passwords shall be representative of the “names” below:
 - (1) Administrators Group:
 - (a)Admin1 / Admin1
 - (b)Admin2 / Admin2
 - (2) Engineers Group:
 - (a)Engr1 / Engr1
 - (b)Engr2 / Engr2
 - (3) Operators Group:
 - (a)Oper1/Oper1
 - (b)Oper2 / Oper2
 - (4) Viewers Group:
 - (a)View1 / View1
 - (b)View2 / View2
 - g. With the exception of the Viewers Group, these users shall not be added to the system until all testing has been completed and the system has been accepted. The Contractor shall accept all responsibility for actions the result from the unauthorized issuance of user names and passwords above the level of viewers prior to system acceptance unless specifically instructed to do so in writing by the Owner.
2. Alarm Processing:
- a. All alarms required by the sequence of control shall be fully configured for delivery to the operator workstations and the alarm files.
 - b. A common alarm file shall be established to receive alarms from all of the field devices.
 - c. A separate alarm file shall be established on a per building basis to receive just the alarms from that building.
 - d. The alarm messages shall be descriptive and include as a minimum:
 - 1) System identification.
 - 2) Date.
 - 3) Time to the second.
 - 4) Nature of the alarm such as high value, low value, or fail to start.
 - e. The system shall be configured to send an alarm message on return to normal.
 - f. All users shall receive all alarms.
3. Reports:
- a. The sequence of control includes the requirements for variables to be trended. The data server is setup to collect all of this data. The operators have the ability to look at the historical trend data on a log basis or in a graphical format as needed. It can be very beneficial to the owner for performance assessments or energy management to have a set of standard reports that analyzes the data and puts it in a format to drive management decisions. Typical examples are:
 - 1) Run time reports on equipment.
 - 2) Performance deviation reports that compare actual performance with specified performance. An example would be the average deviation from set point for space temperature, discharge air temperatures on air handling units, etc.
 - 3) Equipment efficiency reports such as measurements of the KW per TON for a chiller over time.

- b. In this section of the specification, a description of the reports to be prepared should be described. The contractor is best qualified to set these reports up during construction rather than leave this responsibility to the owner after acceptance.

2.09 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.
- 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. Conduit down in walls to space sensors and back to accessible ceiling space to be provided by Division 26. Automatic Controls contractor to coordinate installation of conduit of space sensors with Division 26 and provide if not provided by Division 26.
- 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 unless specifically indicated otherwise herein. 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. However, Class 2 signal wiring may be installed without conduit 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.
- 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, HVAC Energy Management Systems and combination fire-smoke and smoke dampers in accordance with approved rough-in and connection diagrams furnished by the system suppliers only when shown on Division 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.
 - 7. Installation of all control conduit in walls to accessible above ceiling space.
- N. Work Included Under other Sections of Division 23 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 supply wiring to serve new control panels, control transformers, electric control dampers and valve actuators, 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 26, 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, 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 #14 THHN.
 8. Digital Input (D.I.), Analog Input 4-20 mA (A.I.) and Analog Output (A.O.) wiring shall be #18 TSP (twisted shielded stranded pair with drain wire).
 9. Analog Input or voltage types (A.I.) wiring shall be #18 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 conduit 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, automatic dampers and pressure sensing devices which shall be furnished under Sections 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

3.01 SEQUENCE OF OPERATION - EXHAUST FANS

- A. Exhaust fans shall be interlocked, be provided with locally manually controlled 0-12 hour timers where manual switches are scheduled and where specified in other sections of these specifications. The respective fan controlled shall be energized. When a fan is energized, the respective make-up air dampers, where indicated on the Drawings, shall be opened. When fan switch is de-energized, the fan shall stop, and interlocked dampers shall be closed. When ambient temperature is below 40 Deg F, adj. the ventilation fan operation shall be locked out such that the fans can-not be energized until the temperature is above the minimum set point.
- B. Install fan speed control switches at a convenient location on direct drive fans on the load side of the disconnect. Refer to equipment schedules on the Drawings for direct drive fan designation. Fan speed controllers are furnished with the fans as specified under other Sections of these Specifications.

3.02 ELECTRIC UNIT HEATERS

- A. Electric unit heaters shall be controlled by manufacturer furnished thermostats set at 68 Deg.F. (adjustable). On a fall in temperature below 68 Deg.F., the unit heater fan shall be energized after which the stages of heat shall be energized in sequence as needed to satisfy the set point. On a 2 Deg.F., adjustable, rise above set point, the heater will be de-energized in a reverse fashion of that described above.
- B. Mount thermostats, under this Section of Specifications, on wall where indicated on the Drawings.

3.03 SEQUENCE OF OPERATION - GAS FIRED UNIT HEATERS

- A. Unit heater fans and heating elements shall be energized by a unit manufacturer supplied thermostat installed under this Section of Specifications when of the wall mounted type.
- B. Set point shall be 68 Deg. F., adjustable. On a drop in space temperature below set point, energize the unit heater. On a 1-2 Deg. F., adjustable, rise above set point, the heater shall be de-energized and the fan shall cycle off.

3.04 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.

3.05 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.
- D. Each DDC controller used for the main building network controller shall have their own real time clocks.

END OF SECTION

SECTION 23 3000

HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.01 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.

1.02 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; 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.

1.03 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.

1.04 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 60 00.
- 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.

1.05 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.

1.06 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

2.01 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, 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. Rectangular low pressure ducts, for systems designated to be operating at up to one (1) inches W.G., shall be constructed of the following 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"

1. 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.
2. 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

3. 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.
4. 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".
5. 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.
6. 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.

2.02 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.

2.03 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.

2.04 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. The liner insulation system shall be one inch (1") in thickness on all outside air intake ducts, and mixed air plenums to obtain a minimum R-value of 6.0 thereon.
- C. All ductwork systems are required to meet the most recent version of the International Energy Conservation Code.
- D. 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.
- E. 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".
- F. 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.
- G. 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.
- H. 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".
- I. 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.
- J. Where rectangular ducts are lined and adjoins externally insulated rectangular ducts, the two insulations shall be overlapped not less than twenty-four inches (24").
- K. 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.
- L. All exposed ductwork shall be internally lined unless specifically indicated otherwise.
- M. Refer to Section 23 07 00, Insulation, for further related requirements.

- N. Acceptable liner manufacturer shall be:
1. Certainteed, Tough Gard R with enhanced surface.
 2. Knauf, Rotary Duct Liner E-M with Hydrosield.
 3. Owens Corning, Quiet R Acoustic Duct Liner, Type 150 or equivalent Duct Liner Board.
 4. Johns Manville, Linacoustic RC or R-300.

2.05 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.

2.06 FIBERGLASS DUCTBOARD

- A. Fiberglass duct board of any type is not allowed on this project without exception.

PART 3 - EXECUTION

3.01 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. 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.

3.02 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.

3.03 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.

END OF SECTION

SECTION 23 3400

EXHAUST AND SUPPLY AIR FANS

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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.

1.05 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

2.01 EXHAUST FANS - PROPELLER WALL VENTILATOR

- A. Fans shall be belt-driven units as indicated, and shall incorporate a heavy duty stamped steel propeller with six (6) blades attached to a heavy gauge steel spider with steel rivets reinforced on both sides. Motors shall be permanently lubricated and sealed. Belt-driven units shall be complete with cast iron adjustable sheaves.
- B. The fan frame and venturi shall be constructed of heavy gauge painted steel with the fan assembly bolted to the venturi.
- C. Fan bearings shall be of the ball bearing type with a minimum average life of 100,000 hours. Bearings shall be regreasable with grease fittings.
- D. Fan drives shall be designed for 150% of the rated horsepower capabilities. Belts shall be oil resistant type.
- E. Provide propeller steel wall fans, which shall be statically and dynamically balanced.
- F. Fans shall have capacities as scheduled on the Drawings, all tested, approved, and rated, and bearing the AMCA Seal of Approval.
- G. Propeller wall fans shall be furnished with a steel box, wire fan guard on the motor side, an adjustable anchor angle to adjust to the thickness of the wall, backdraft dampers in the discharge, and rain hoods on the outlet of the fan mounted external to the building.
- H. Acceptable manufacturers:
 - 1. Loren Cook.
 - 2. Greenheck.
 - 3. Acme.
 - 4. Penn.
 - 5. FloAire.
 - 6. Twin City Fans and Blowers.

PART 3 - EXECUTION

3.01 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.

3.02 EXHAUST FANS - INSTALLATION

- A. Install fans level 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.

3.03 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 5533

HEAT GENERATION - GAS FIRED APPLIANCES

PART 1 - GENERAL

1.01 REFERENCED 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 trades.

1.02 SYSTEM DESCRIPTION

- A. Furnish and install gas fired unit heaters, flues, and accessories as indicated and specified herein.
- B. All items of equipment shall meet or exceed scheduled capacities and shall be provided in quantities indicated.

1.03 QUALITY ASSURANCE

- A. All work shall comply with the most recent editions, with amendments, of the City Building Code, Mechanical Code, Plumbing Code, Fire Code, and all other state and local codes or ordinances.
- B. All gas fired equipment and accessories shall be American Gas Association (AGA) approved.
- C. All furnace and heat exchanger units shall be warranted for parts for a minimum of ten (10) years, with labor included for the first year of warranty which shall start at "Substantial Completion".

1.04 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings in accordance with Division 1 and Section 23 0500.
- B. Submit manufacturer's descriptive literature and installation instructions, along with materials of construction, quantities, sizes, and any other descriptive literature necessary to fully evaluate submittals for compliance with these specifications. Include fan curves for centrifugal fans, where applicable.
- C. Furnish power supply and control wiring diagrams for each piece of equipment.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Damaged, deteriorated, or wet materials shall be rejected and replaced.
- B. Take all measures necessary to protect equipment from damage or vandalism during construction. Any such damage discovered shall be cause for rejection of equipment, in which case the Contractor shall repair or replace equipment at no cost to the Owner.
- C. Storage and protection of equipment and accessories shall be in accordance with Division 1 and Section 23 0500.

PART 2 - PRODUCTS

2.01 GAS FIRED UNIT HEATERS

- A. Each unit heater shall be complete with aluminized steel heat exchanger, gas train with burners suitable for natural gas, electronic spark ignition with intermittent pilot, high limit switch, fan delay control, gas cock, union, redundant combination gas valve, pressure regulator, main shut-off valve, power ventor with metered combustion air, propeller fan with low speed (1550 RPM maximum) motor, fan guard, two-way discharge louvers with minimum stops, except units less than 30,000 BTUH capacity which shall only have horizontal directional louvers, 24 volt control voltage transformer, terminal strip connector, wall mounting thermostat with summer only fan switch with number of stages to match heater, motor thermal overload protection, and propeller fan inlet guards (top and bottom). Provide unit mounted manufacturer furnished disconnect switch.
- B. Units shall be furnished with a factory applied baked enamel paint finish. Provide two-point threaded hanger connection on units weighing less than 100 pounds and four-point connections on units over 100 pounds in weight.
- C. Heat exchangers shall have a non-prorated ten year warranty. Units shall be AGA approved and meet scheduled capacities and efficiencies. Units 150,000 BTUH, or larger, input capacity shall have two (2) stages of heat. Units shall have a vertical combustion air/vent kit including concentric adapter.
- D. Acceptable manufacturers:
 - 1. Reznor.
 - 2. Sterling.
 - 3. Trane.
 - 4. Modine.

2.02 CONCENTRIC FLUE VENT/COMBUSTION AIR INTAKE PIPING

- A. Provide combination flue vent/combustion air intake piping from each unit through roof to combination vent/intake air termination kit. The fittings and lengths shall be determined from actual field measurements.
- B. Pipe shall be UL listed stainless steel AL-29-4C Positive Pressure vent materials. The vent must be sized in accordance with the manufacturer's recommendations.
- C. Fittings, all sizes: UL listed stainless steel AL-29-4C Positive Pressure vent materials.
- D. Vent/intake air roof termination kit shall be factory made as manufactured by unit manufacturer and shall be AGA certified.

2.03 GAS FIRED APPLIANCE FLUE PIPING

- A. Provide a complete flue piping system sized specifically for each gas fired appliance and related installation conditions as indicated on the Drawings.
- B. Furnish Type "RV" or "QV" double wall, U.L. approved, flue vent piping, fittings, and flashings for all gas burning devices requiring such; but not limited to, gas-fired unit heaters and any other vented gas heaters or appliances.

- C. Flues shall extend full size through roof with tall flashing and storm collars which shall terminate with a combination flue vent/combustion air intake piping from each unit through roof to combination vent/intake air termination kit. The fittings and lengths shall be determined from actual field measurements.
- D. The vent must be sized in accordance with the manufacturer's recommendations.
- E. Vent/intake air roof termination kit shall be factory made as manufactured by the unit manufacturer and shall be AGA certified.
- F. Acceptable Manufacturer:
 - 1. Heatfab.
 - 2. Metal-Fab.

PART 3 - EXECUTION

3.01 DELIVERY AND PROTECTION

- A. Deliver all equipment to each site as indicated in Division 1 and Section 23 0500.
- B. 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.
- C. Any item of equipment or accessories damaged after installation, prior to "Substantial Completion", shall be repaired or replaced at no cost to the Owner.

3.02 INSTALLATION

- A. Install all gas burning equipment and flues in accordance with the recommendations of the unit manufacturers, in compliance with all governing code authorities, and as indicated on the Drawings. Install suspended equipment level and on vibration isolation devices where specified herein or in other sections of these specifications. Suspended equipment shall be set level using all-thread hangers from the overhead structure.
- B. Make final gas connections to all gas burning equipment with unions and gas cocks at each piece of equipment, to include sediment legs.
- C. Install flues and vent caps for each piece of gas burning equipment, unless indicated otherwise. Flash and counterflash in accordance with the recommendations of the roofing system manufacturer. Seal all fittings with high temperature silicone caulking.

3.03 WARRANTY

- A. Provide a one (1) year warranty for all equipment and installations from the date of "Substantial Completion".
- B. Furnish extended warranties for each item of equipment as specified herein.

3.04 OPERATIONS AND MAINTENANCE (O&M) MANUALS

- A. Refer to Section 23 0500.

- B. Provide copies of approved Shop Drawings along with specific O&M Manuals for each piece of equipment and a complete spare parts list.

END OF SECTION

SECTION 23 8246

UNIT HEATERS - ELECTRIC

PART 1 - GENERAL

1.01 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 trades.

1.02 SYSTEM DESCRIPTION

- A. Scope of work shall include furnishing and installation of electric unit heaters and accessories as indicated and specified herein.
- B. All items of equipment shall meet or exceed scheduled capacities and shall be provided in quantities indicated.

1.03 QUALITY ASSURANCE

- A. All work shall comply with the most recent edition, with amendments of the local Building Code, Mechanical Code, Plumbing Code, Fire Code, and all other state and local codes or ordinances.
- B. All heaters shall be Underwriters Laboratory (U.L.) listed and shall be listed for the specific installation application.
- C. All equipment installations shall be installed in accordance with the National Electrical Code (NEC).
- D. The manufacturer of each type of equipment specified herein shall have a minimum of five (5) years operating experience with each heater type.

1.04 SUBMITTALS

- A. Indicate equipment, materials, quantities, sizes, installation details and any other descriptive literature necessary to fully evaluate submittals for compliance with these specifications.
- B. Provide power supply and control wiring diagrams suitable for use by an electrician and control wiring technician.
- C. Shop Drawings: Submit complete shop drawings in accordance with Division 1 and Section 23 0500.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Damaged, deteriorated, or wet materials shall be rejected and replaced.
- B. Take all measures necessary to protect equipment from damage or vandalism during construction. Any such damage discovered shall be cause for rejection of equipment, in which case the Contractor shall replace equipment at no cost to the Owner.

PART 2 - PRODUCTS

2.01 ELECTRIC UNIT HEATERS

- A. Provide electric unit heaters which shall be complete packaged units with controls and accessories as specified herein to meet scheduled capacities as indicated on the Drawings.

- B. Units shall be furnished with a minimum 18 gauge, die formed, steel cabinet with a factory applied phosphate coating and baked enamel paint finish.
- C. Each unit shall have a direct drive fan motor with axial flow propeller blade fan. Fan motor shall be permanently lubricated with sealed bearings and internal overloads. Motor shall be the totally enclosed type rated for continuous heavy duty all angle operation and equipped with built-in thermal overload protection. Fan speed shall not exceed 1600 RPM.
- D. Electric heating elements shall be low temperature enclosed style metal sheath type. Elements shall be made of steel and monel and have a copper clad steel sheath and aluminum fins warranted for five (5) years. Elements shall have automatic reset thermal overload protection to shut down elements and fan if safe operating temperatures are exceeded.
- E. Units shall be provided with a control transformer to utilize a 24 volt control circuit (unless unavailable and then unit power single phase voltage shall be used) with fan time delay control to purge unit of excess heat after unit shut down, and an automatic high limit cut-out. Motor contacts shall be provided on three-phase units and all units larger than 5.0 KW.
- F. Units shall be furnished with wall mounting thermostat with Summer "Fan Only" switch, off switch, 65 Deg.F. to 90 Deg.F. range and heat position switch with number of stages to match scheduled heater.
- G. Provide mounting brackets for ceiling suspension or wall swivel mount suitable for the applicable installation condition or as indicated on the Drawings. Provide minimum two point threaded hanger connection, mounting sockets, on suspended units over 100 pounds in weight. Provide four point connections on units over 200 pounds in weight.
- H. Each unit shall be design-certified by Underwriters Laboratories and be UL listed and meet the requirements of the NEC.
- I. Supply air shall be drawn and discharged through an outward drawn venturi. Provide individual, adjustable, horizontal discharge air louvers with 30 Degrees downward stops to prevent complete shut-off of air flow.
- J. Heater shall be designed for a single electrical circuit, with elements, motor and control circuits subdivided with factory fuses to conform to the National Electric Code and Underwriter's Laboratory requirements. An access panel, with wiring diagram attached, shall be provided for access to electrical control circuiting and protective devices.
- K. Acceptable manufacturers:
 - 1. Q-Mark.
 - 2. Reznor.
 - 3. Trane.
 - 4. Modine.
 - 5. Emerson.
 - 6. Markel.
 - 7. BERKO.
 - 8. Indeeco.

PART 3 - EXECUTION

3.01 DELIVERY AND PROTECTION

- A. Deliver all equipment to each site as indicated in Division 1.
- B. 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.

- C. Protect equipment during construction. Equipment damaged during construction prior to "Substantial Completion" shall be repaired or replaced at no cost to the Owner.

3.02 INSTALLATION

- A. Install and wire electric heating equipment and field installed appurtenances in full accordance with the recommendations of the unit manufacturers and as indicated on the Drawings.
- B. Provide power and control wiring as specified herein and as indicated on the Drawings.
- C. Follow all national and local codes related to the wiring of electrical heating devices.
- D. Verify correct installation and operation of each device installed.

END OF SECTION

SECTION 26 0000

ELECTRICAL

PART 1 - GENERAL

1.01 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.

1.02 DEFINITIONS

- A. The following definitions shall apply to all sections of this Division:
 - 1. "Owner" shall mean the Owner or his designated representative.

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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.

1.08 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.
- D. Refer to Division 1 requirements.

1.09 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.

1. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. Shop Drawings shall be accompanied by certification from this Contractor that Shop Drawings have been checked by him for compliance with Contract Drawings.
- J. Samples of various products or mock-ups of particular details or systems may be required by various sections of this Specification.
- K. 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.
 - 1. Where specified product is not manufactured, manufacturer's current product meeting specification shall be substituted, subject to written approval of Engineer.
- B. 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.
- C. 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.
- D. 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.

- E. 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

3.01 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.

3.02 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 0501

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.02 DESCRIPTION

- 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. Provide labor, materials, equipment, tools and services as required to complete the demolition work indicated.
- C. Refer to Division 1 for "Schedule of Work".

1.03 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 power, and other systems, and maintain existing functions in service, except for scheduled disruptions as allowed in Division 01, "General Conditions".
- C. Provide all temporary connections as necessary to facilitate the phasing of construction.

1.04 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. 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.
- C. The attendant conduit, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No hangers, etc., shall be abandoned in place.
- D. 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.
8. Coordinate with the General Contractor repairs required to bring finishes back to their original conditions after demolition and or installation of new equipment.

1.05 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 and legally dispose of off-site.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide materials and equipment for patching and extending work as specified in individual sections or as indicated on the Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Field Conditions: Demolition Drawings are based on non-invasive field observations and existing record documents. Report discrepancies in location, dimensions or quantity to Owner and Architect prior to disturbing existing installation.
- B. Existing Conditions: Commencing demolition means Contractor accepts existing conditions.

3.02 PREPARATION

- A. Demolition: Disconnect electrical systems in walls, floors, ceilings and equipment scheduled for removal.
- B. Project Coordination: Coordinate utility service outages with utility companies and schedule work with Facility management and Owner.
- C. Temporary Wiring: Provide temporary wiring and connections as necessary to maintain existing systems in service during construction.
- D. Schedule installation of temporary wiring and connections to eliminate hazard to installing personnel.
 1. When work must be performed on energized circuits or equipment, use qualified personnel experienced in such operations.
 2. Submit "hot work" policy information to Architect for review prior to performing work on any energized circuits.
- E. Electrical Service: Maintain existing system in operation until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission, in writing, from Owner prior to partially or completely disabling system. Minimize outage duration.

Make temporary connections as necessary to maintain service to areas unaffected by the Scope of Work.

3.03 DEMOLITION AND EXTENSION OF EXISTING WORK

- A. General: Demolish and extend existing work as indicated or described in the Drawings and Specifications.
- B. Wiring: Remove abandoned wiring and cables to source of supply or termination.
- C. Raceways:
 - 1. Remove exposed abandoned conduits and raceways, including abandoned conduits and raceways above accessible ceilings.
 - 2. Conduits and raceways concealed in existing construction to remain shall be abandoned in place. Cut conduits and raceways such that finished surfaces can be patched smooth.
- D. Wiring Devices: Remove abandoned wiring devices. Provide blank device plate for outlet box not being removed.
- E. Electrical Distribution Equipment: Disconnect and remove abandoned panelboards and electrical distribution equipment.
- F. Existing Installations to Remain: Maintain access to existing electrical installations which remain active.
- G. Modify installation or provide access panel as required.
- H. Extension of existing circuits: Extend existing installations as required to maintain service to items to remain using materials and methods, as specified that are compatible with original installation.
- I. Adjacent Construction: Repair adjacent construction and finishes damaged during demolition and extension work.

3.04 SALVAGED MATERIALS

- A. Salvage existing materials for re-installation as directed by Owner. Coordinate locations for storage of salvaged materials with Owner.

3.05 CLEANING AND REPAIR

- A. Existing Materials: Clean and repair existing materials and equipment which remain or are to be re-used.
- B. Existing Panel boards: Clean exposed surfaces and check tightness of all electrical connections. Replace damaged circuit breakers with units of compatible construction and provide closure plates for vacant positions.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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

1.05 SUBMITTALS

- A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer's product literature completely describing conductors and cable assemblies and evidence of U.L. Listing.

1.06 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.

1.07 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

1.08 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

2.01 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. Aluminum Conductors
 - 1. Conductors shall be aluminum only on feeders 800 amps and larger as shown on drawings.
 - 2. Aluminum conductors shall be AA-8000 Series electrical grade aluminum alloy.
 - 3. Sizes No. 8 AWG and larger shall be concentric lay compact strand, Class B stranding.
 - 4. Shall conform to the Conductor Properties proscribed by the NEC.
- C. 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.
- D. 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

3.01 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.
- C. Type MC Cable (ALTERNATE BID). As an alternate bid, type MC Branch Circuit cable shall be permitted for branch circuit wiring and where concealed in stud spaces of dry wall partitions. NEC requirements for supporting from the structure independent of ceiling systems or ceiling support wires will be strictly mandated.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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 racewaysystem.
- 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.

3.07 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 0520

CABLE CONNECTIONS

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.02 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

1.03 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.

1.04 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.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Connections shall be made in atmospheres that are free from dirt, moisture, and elements which may be damaging.

1.06 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

2.01 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

3.01 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.

3.02 PREPARATION

- A. Remove proper amount of insulation necessary for connection, clean conductors.

3.03 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.

3.04 FIELD QUALITY CONTROL

- A. Test: Connections shall be resistance tested with megohm meter as specified for wire.

3.05 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 0523

CONTROL VOLTAGE ELECTRICAL POWERCABLES

PART 1 - GENERAL

1.01 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.

1.02 DESCRIPTION

- A. Work Included: Provide power wiring, raceways, and connections for items of equipment and control systems.
- B. 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

1.03 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.

1.04 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.

1.05 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

2.01 MATERIALS

- A. Refer to related work specified in other sections for material requirements.

PART 3 - EXECUTION

3.01 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.

3.02 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 conduit 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 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 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.
- C. Provide connections from the grounding electrode system to:
 - 1. The electric power system grounded circuit conductor (neutral).
 - 2. The electric power system non-current carrying enclosures and equipment ground conductors (equipment ground).
- D. Provide connections from the grounding electrode system to auxiliary ground conductors for data and voice communication systems (isolated ground).

1.03 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.

1.04 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.

1.05 SUBMITTALS

- A. Where products are of a manufacturer other than listed as acceptable manufacturers, submit manufacturer's product literature completely describing conductors and cable assemblies and evidence of U.L. Listing.

1.06 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.

1.07 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.

1.08 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

2.01 GROUND RODS

- A. Standard ground rods shall be 3/4 inch diameter, 10 foot length, copper clad steel, equal to Thompson Company.

2.02 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.

2.03 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.

2.04 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

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.02 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

1.03 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.

1.04 SUBMITTALS

- A. Product Data: If materials are by manufacturers other than specified, submit product data giving complete description.

1.05 MANUFACTURERS

- A. Listed with Materials.
- B. Acceptable Manufacturers
 - 1. Kindorf
 - 2. Unistrut
 - 3. Caddy

PART 2 - PRODUCTS

2.01 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

3.01 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.

3.02 CLEANING

- A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 0532

RACEWAYS

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect conduits and finishes from damage.

1.06 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: Triangle, Allied, and Wheatland.
 - 2. Nonmetallic Conduits: Carlon, Cantex, and SEDCO.
 - 3. Others: As listed with products.

1.07 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

2.01 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.
- 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. Elbows and Bends:
 - 1. Rigid nonmetallic conduit systems: Rigid metal electrical conduits.
 - 2. Other Conduit Systems: Same material as the conduit with which they are installed.
 - 3. All Types: Size 1-1/4 inch and larger shall be factory manufactured.
- G. 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.
- H. Locknuts:
 - 1. 1-1/2" and Smaller: Zinc plated heavy stock steel, O-Z/Gedney.
 - 2. 2" and Larger: Cadmium plated malleable iron, O-Z/Gedney.
- I. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney.
- J. E.M.T. Compression Connectors: Gland compression type, zinc plated steel body, cadmium plated, malleable iron nut, insulated throat, O-Z/Gedney.
- K. E.M.T. Compression Couplings: Gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney.
- L. Liquidtight Conduit Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally cast external ground lug, O-Z/Gedney.
- M. 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.
- N. Seals for Penetrations through Existing Walls: Thunderline Corporation Link-Seal watertight sleeves, complete with wall and casing seals.
- O. Fire Seals: Galvanized iron pipe sleeves sealed with approved foam type fireproofing.

- P. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers selected for linear or linear with deflection, as required.
- Q. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10.
- R. Accessories: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron on the forms and dimensions best suited for the application.
- S. 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.
- T. 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

3.01 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.

3.02 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 1/2".
- 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 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. Install rigid metal electrical conduit for all uses in damp and wet locations, in hazardous areas, in crawl spaces, in concrete slabs, in locations subject to physical damage, and for feeder sizes 2-1/2" and larger.
- T. Apply two (2) coats of bituminous paint to all portions of rigid metal conduits in contact with concrete and/or the ground.
- U. Install electrical metallic tubing for branch circuits concealed in walls and above ceiling and for feeder sizes 2" and smaller.
- V. Install rigid non-metallic conduit with manufactured spacers and with concrete encasement with 3 cover top, bottom, and sides for feeders and service entrances run below grade exterior to the building. Use rigid metal electrical conduit for elbows, and exposed portions. Concrete shall have red pigment.
- W. Where permitted by authorities having jurisdiction, flexible metal conduit may be used for final connection to individual light fixtures from junction boxes mounted on, or suspended from, the building structure. Maximum length shall be 6'-0", minimum of 3'-0". Minimum size shall be 1/2". Flexible conduit connections between light fixtures are not allowed.
- X. Use liquid-tight flexible conduit in damp and wet locations, and in food service connections.
- Y. 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.
- Z. Provide pullstring in each empty conduit. Label pullstring when conduit termination is not obvious.

END OF SECTION

SECTION 26 0533

BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 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 Section 26 51 00
 - 4. Control Voltage Electrical Power Cables: Section 26 05 23

1.03 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.

1.04 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.

1.05 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

2.01 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. Floor Outlet Boxes: Hubbell cast flush floor boxes, fully adjustable with flush service fitting, and carpet flange (if required).

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 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.

3.04 CLEANING

- A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 0573

ELECTRIC POWER SYSTEM ANALYSIS

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.

1.02 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.

1.03 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.

1.04 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.

1.05 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 Flash 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

2.01 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.

2.02 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 diagramming 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.

2.03 ARC FLASH LABELS

- A. Arc flash labels shall be printed on self adhesive durable material resistant to fading, moisture, or peeling.

PART 3 - EXECUTION

3.01 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 ratios.
 - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
 - d. Feeders: Conduit material, sizes of conductors, conductor material, insulation, and length.
 - e. Busway ampacity and impedance.
 - f. 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. Ratings, types, and settings of utility company's overcurrent protective devices.
 - e. Special overcurrent protective device settings or types stipulated by utility company.
 - f. Time-current-characteristic curves of devices indicated to be coordinated.
 - g. 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.
 - h. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
 - i. Panelboards, switchboards, ampacity, and interrupting rating in ampere rms symmetrical.

- j. Motor controller ratings including reduced voltage types, variable frequency drive ratings, and motor controller bypasses.

3.02 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 starters and controllers
 - 7. 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 ratios 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 1/2-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.

3.03 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 exists between devices installed in series, including power utility company's upstream devices. 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.

3.04 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 starters and controllers
 - 7. 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/Cm^2
 - 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 0926

LIGHTING CONTROLS SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 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 0000 Electrical
 - 2. 26 0519 Low Voltage Electrical Power Conductors and Cables
 - 3. 26 9532 Raceways
 - 4. 26 0533 Raceway Boxes for Electrical Systems

1.03 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.

1.04 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.

1.05 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.

1.06 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

1.07 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

2.01 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.

2.02 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Eaton Lighting Systems (Formerly Cooper Controls)

- a. System: Room Controller
- 2. Basis of design product: Eaton Lighting Systems Room Controller is subject to compliance and prior approval with specified requirements of this section, one of the following:
 - a. Eaton Lighting Systems Room Controller

2.03 WALL OR CEILING MOUNTED OCCUPANCY PERFORMANCE REQUIREMENTS

- A. Sensing mechanism:
 - 1. Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - 2. Ultrasonic:
 - a. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - b. Utilize Doppler shift ultrasonic detection technology.
 - 3. Dual technology:
 - a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.
- B. Power failure memory:
 - 1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.
- C. Designed and tested to withstand discharges of 15,000 volts per IEC 801-2 without impairment of performance.
- D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.
- E. Sensor shall have time delays from 10 to 20 min.
- F. When specified, sensors shall automatically adjust time delay and sensitivity settings.
- G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
- H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
- I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.04 CEILING MOUNTED SENSORS

- A. Provide all necessary mounting hardware and instructions.

- B. Sensors shall be Class 2 devices.
- C. Connect to Room Controller via Click & Go cable to eliminate wiring errors.
 - 1. [OCC-RJ45] Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize Click & Go cable connections.
 - 2. Two 0020RJ45 connection ports for connection to Room Controller.
 - 3. Occupancy Sensor and Daylight sensor shall be capable of a daisy chain connection to the Room Controller.
- D. Device calibration and features:
 - 1. Sensitivity - 0-100% in 10% increments.
 - 2. Time delay - 1-30, self-adjusts to 10 min based on room occupancy.
 - 3. Test mode - Fifteen second time delay.
 - 4. Detection technology - PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - 5. Walk-through mode.
 - 6. Ultrasonic and Dual Technology Sensors utilize two independent sensor detection circuits simultaneously to ensure optimum performance, regardless of location or proximity to walls and structures.
 - 7. Ultrasonic and Dual Technology Sensors utilize Variable Drive Circuitry (VDC) in cases of over saturation from misapplication, which automatically adjusts the volumetric output without reducing detection capability. Systems that reduce detection coverage area shall not be acceptable.
 - 8. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency, continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
 - 9. All load parameters including Automatic On/Manual On, blink warning and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.
- E. Device Status LEDs including:
 - 1. PIR Detection
 - 2. Ultrasonic detection
- F. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.
- G. Manual override of controlled loads.
- H. Multiple occupancy sensors may be installed in a room by simply daisy-chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required
- I. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].
- J. Sensors shall be RoHS compliant.
- K. Device Status LEDs including:
 - 1. PIR Detection
 - 2. Ultrasonic detection
- L. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.
- M. Manual override of controlled loads.

- N. Multiple occupancy sensors may be installed in a room by simply daisy chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required
- O. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].
- P. Sensors shall be RoHS compliant.

2.05 ROOM CONTROLLER ZONE WALLSTATIONS

- A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:
 - 1. Intuitive button labeling to match application and load controls.
 - 2. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations which are automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out of the box functionality.
- B. Two RJ-45 ports for connection to the Room Controller local network.
- C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.
- D. Room Controller digital wallstations are delivered with pre-defined functions including, raise, lower, A/V Mode, Quiet Time, manual and scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.
- E. Optional custom labeling is available for application or location specific wallstation button labels.

2.06 DAYLIGHTING ADJUSTMENT HANDHELD REMOTE CONTROLS

- A. Battery-operated handheld 10 button configuration for remote daylight sensor configuration. Remote controls shall include the following features:
 - 1. Two-way infrared (IR) transceiver for line of sight communication with the Room Controller daylight sensors within up to 30 feet.
 - 2. Red communication LED on the daylight sensor confirms button press.
 - 3. Inactivity timeout to save battery life.
- B. Three intuitive daylight sensor range pushbuttons.
- C. Intuitive daylight zone adjustment raise/lower pushbuttons.
- D. Eaton Lighting Systems catalog numbers: [HHPRG-RC].

2.07 ROOM CONTROLLERS

- A. Room Controllers are fully functional out-of-the-box to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will include line voltage wiring space and will not require additional electrical junction boxes. The control units will include the following features:
- B. Fully functional room configuration to the most energy-efficient sequence of operation based upon the connected devices in the room.

- C. Simple replacement - Using the automatic configuration capabilities, a Room Controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
- D. Quick installation features including:
 - 1. Included line voltage space to simplify wiring and eliminate the need for separate junction boxes.
 - 2. Included emergency voltage space to simplify wiring of emergency luminaire connections.
 - 3. Breakouts or knockouts for direct conduit connection.
 - 4. Line and low voltage sections include conduit connection points. Systems that require special accessories for direct conduit connections may not comply with local building codes and shall not be acceptable.
 - 5. Quick low voltage connections using standard RJ45 QuickConnect cable.
 - 6. Dual voltage (120/277 VAC, 60 Hz).
 - 7. Zero cross circuitry for each load.
 - 8. Three relay configuration.
 - 9. Efficient 150 mA switching power supply.
 - 10. Six RJ45 Click & Go local network ports.
 - 11. All models shall be available in either a plastic or metal enclosure for simplified installation in appropriate spaces
 - 12. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
- E. On/Off/Dimming Room Controllers shall include:
 - 1. Real time current metering (optional).
 - 2. Room Controller metal enclosure options include a “-PL” in the catalog number.
 - 3. Room Controller Network options include a “-N” in the catalog number.
 - 4. Three re006Cay, three 0-10V dimming zone configuration with one emergency UL 924 relay [RC3DE-PL,].
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
 - b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.

2.08 DAYLIGHT PHOTOSENSORS/ IR RECEIVER)

- A. Daylight photosensors work with Room Controllers to provide automatic daylight dimming capabilities for any load type connected to a room controller. Open loop daylight sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Daylight sensors shall be interchangeable without the need for rewiring. Daylight sensors shall be capable of daisy-chaining with occupancy sensors in each room.
- B. Digital daylight sensors include the following features:
 - 1. An internal photodiode that measures only within the visible spectrum and has a response curve that closely matches the photopic curve.
 - 2. The daylight sensor has three light level ranges: Low (3-300 lux), High (30-3000 lux), and Direct Sun (300-30000 lux).
 - 3. For dimming daylight harvesting, the daylight sensor shall provide the capability of controlling multiple (up to three) daylight zones immediately upon connection without programming.
 - 4. Optional digital wallstations to allow occupants to reduce lighting level to increase energy savings and lower lighting levels for a selected period of time or cycle of occupancy.

5. Infrared (IR) transceiver for daylight sensor range and daylight zone gain adjustments via handheld remote programmer. [HHPRG-RC]
 6. Infrared (IR) receiver for personal control and scene programming via handheld remote programmer. [HHPR-RC]
 7. Red configuration LED that blinks to indicate data transmission.
 8. Green Mode status LED that blinks to indicate Daylight Commissioning Mode.
 9. Green Mode status LED that remains constant ON when daylight range is set to low for available natural light.
 10. One RJ45 port for connection to Room Controller local network.
 11. An adjustable head and an optional mounting bracket to accommodate multiple mounting methods and building materials. The daylight sensor may be mounted on a ceiling tile, skylight well, suspended lighting fixture or Backbox.
- C. Open loop digital daylight sensor includes the following additional features:
1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
 2. Automatically establishes dimming set-points upon power up without any programming. Optional calibration using the wireless IR handheld programmer. [HHPRG-RC]
 3. Eaton Lighting Systems Catalog Number: [DS-FMOIR].

2.09 EMERGENCY LIGHTING

- A. Room Controller with emergency relay – The Room Controller is a UL 924 listed device that monitors normal power circuit to the Room Controller. The Room Controller has a dedicated UL 924 output which includes emergency power line in and emergency power load out connections. The UL 924 relay will track with output 1 (Yellow) during normal power operations. Upon loss of normal power the UL 924 output will force the emergency lighting On and full bright (if dimming) until normal power is restored. Features include:
1. 120/277VAC, 50/60 Hz, 3 amp ballast rating.
 2. Ladderless testing: Push the “All Off” button on any wallstation four times [e-mer-gency], will turn off normal lighting and force UL 924 emergency output On and full bright.
 3. Auxiliary input for remote Alert Mode (All On, and full bright).
 4. Eaton Lighting Systems Catalog Number: [RC3DE], [RC3DE-PL].
- B. Emergency Power Control – A UL 924 listed device installs down line of an output that monitors a switched or dimmed circuit providing normal lighting to an area. The unit provides normal ON/OFF or 0-10V dimming control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
1. 120/277 volts, 50/60 Hz, 20 amp ballast rating.
 2. Push to test button.
 3. Eaton Lighting Systems Catalog Numbers:
 - a. [CEPC-1] (switching)
 - b. [CEPC-1-D] (0-10V dimming)

PART 3 - EXECUTION

3.01 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 multi-conductor 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.

3.02 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.

3.03 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 2101

LOW VOLTAGE ELECTRICAL POWER SYSTEMS

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. All sections of this specification.

1.02 DESCRIPTION

- A. Work Included: Provide grounding and protective equipment for each secondary electric service connection.

1.03 QUALITY ASSURANCE

- A. Comply with the latest edition of the National Electrical Code and applicable local codes and ordinances.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Products shall comply with the requirements of other sections of this specification.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. For each new electrical service the 277/480 volt, three phase, four wire connection at the utility padmount transformer shall be considered to be a point of secondary electric service delivery, and accordingly shall be grounded, and provided with ground fault protection relaying in accordance with applicable provisions of the National Electrical Code.
- B. Care shall be taken during the installation and testing to assure that the neutral is grounded at the point of service ahead of any main device or ground fault protective device, and that no other intentional or unintentional grounding of the neutral conductor is permitted which would affect the operation of ground fault relaying or overcurrent devices.

END OF SECTION

SECTION 26 2213

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 REFERENCED STANDARDS

- A. NEMA ST-20 Dry Type Transformers for General Applications
- B. NEMA TP-1 Guide for Determining Energy Efficiency for Distribution Transformers
- C. UL 1561 Dry Type General Purpose and Distribution Transformers
- D. ANSI C57.110 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

1.05 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.

1.06 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.

1.07 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. Cutler Hammer

1.08 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

2.01 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.

2.02 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 hysteresis 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.

2.03 SOUND LEVELS

- A. Sound levels shall not exceed the following:

- 1. 15 to 50 KVA - 45dB
- 2. 51 to 150 KVA - 50dB
- 3. 151 to 300 KVA - 55Db
- 4. 301 to 500 KVA - 60dB
- 5. 501 to 700 KVA - 62dB
- 6. 701 to 1000 KVA - 64dB

2.04 OUTDOOR INSTALLATIONS

- A. For outdoor installations, transformers shall be provided with weather shield for NEMA 3R enclosure designation.

2.05 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

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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 2413

CIRCUIT BREAKER DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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. Cutler Hammer.

1.08 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

2.01 SWITCHBOARD - GENERAL

- A. Switchboards shall be provided with neutral to ground disconnecting links and 4 U.L. Service Entrance Labels.
- B. Short Circuit Current Rating: Switchboards shall be rated with a short circuit current rating as indicated on the drawings, or a minimum of 100,000 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: Type 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.

2.02 SWITCHBOARD - INCOMING MAIN SECTION DEVICES

A. Main Circuit Breaker

- 1. Two-step stored energy electronic trip molded case circuit breakers
 - a. Individually fixed mounted through 4000 A
 - 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.
 - 5) All circuit breakers shall be equipped with electrical accessories as noted on the drawings.
 - 6) 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.
 - 7) Breaker faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIC ratings.
 - 8) Each circuit breaker shall be equipped with a push-to-trip button to mechanically operate the circuit breaker tripping mechanism.
 - 9) Provide true two-step stored energy mechanism for 5 cycle closing.
 - 10) Energy required to close breaker shall be stored pending release to close action. All circuit breakers shall have multiple CHARGE/CLOSE provisions allowing the following sequence: CHARGE, CLOSE, RECHARGE, OPEN/CLOSE/OPEN.
 - 11) Furnish local control push buttons to OPEN and CLOSE circuit breaker. Color coded visual indication of contact position (OPEN or CLOSED) shall be provided on the front of the breaker. Provide for local manual charging following CLOSE operation. Color-coded visual indication of mechanism CHARGED and DISCHARGED position shall be provided on the face of the breaker. Visual indicator shall indicate CHARGED only when closing springs are completely charged.
 - 12) Electrically Operated Circuit Breaker
 - a) Each circuit breaker shall be electrically operated to permit remote CHARGE, CLOSE, and OPEN capabilities. Electrically operated circuit

breaker shall be equipped with charge contact switch for remote indication of mechanism charge status.

13) 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

14) Each circuit breaker trip system is to include an externally accessible test port for use with a Universal Equipment Test Set. Provide one (1) Universal Equipment Test Set for this project job for final inspection. This test set shall be suitable for testing all electric circuit breakers specified for this project. No disassembly of the circuit breaker is required for testing.

15) 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.

2.03 SWITCHBOARD - DISTRIBUTION SECTION DEVICES

A. Branch Circuit Breakers

- 1. Thermal magnetic molded case circuit breakers, for ratings 250 amperes and less.
 - a. Group mounted.
 - 1) Circuit protective devices shall be molded case circuit breakers. Circuit breakers shall be standard, high, or extra high interrupting capacity, or true current limiting as indicated on the drawings.
- 2. Electronic trip molded case standard function 80% rated circuit breakers.
 - a. Group mounted 300 amperes 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

- (1) Each circuit breaker shall be capable of being removed from the front of the switchboard.

2.04 INSTRUMENTATION

- A. Provide a Square D Class 3020 PM820 PowerLogic Power Meter with display. Devices by others will be considered providing all the following specifications are met.
- B. The information displayed by the Power Meter shall include the following quantities:
1. Current, per-phase
 2. Volts, phase-to-phase & phase-neutral
 3. Real Power (kW), three-phase total
 4. Reactive Power (kVAR), three phase total
 5. Apparent Power (kVA), three phase total
 6. Power Factor, true, per-phase & three-phase total
 7. Frequency
 8. Current Demand, per phase and neutral, present and peak
 9. Real Power Demand (kWd), three phase total, present and peak
 10. Reactive Power Demand (kVARd), three phase total, present and peak
 11. Apparent Power Demand (kVAd), three phase total, present and peak
 12. Real Energy (kWh), three phase total
 13. Reactive Energy (kVARh), three phase total
 14. Apparent Energy (kVAh), three phase total
 15. Energy Accumulation Modes, signed, absolute, energy in, energy out
 16. Watt-hour KYZ Pulse Initiator Output
 17. Total Harmonic Distortion, Voltage
 18. Total Harmonic Distortion, Current
 19. Date/Time Stamping.
 20. Communications port for Power Monitoring Systems communications and Bacnet IP communications.
- C. The Power Meter shall be accurate to .25% for voltage and current sensing, .50% for power, energy, & demand sensing, and 1% for power factor sensing.
- D. All information stored in the Power Meter shall be remotely accessible through data communications.
- E. The Power Meter shall be UL Listed, rated for an operating temperature range of 0 C to 55 C and have an overcurrent withstand rating of 500 amps for 1 second.
- F. The Power Meter metering inputs shall utilize industry standard current transformers (5A secondary CT's), have VT inputs for direct connection of VT leads to up to 600V, and adhere to UL standard 508 for dielectric voltage-withstand.
- G. Provide with Modbus IP gateway and Modbus network for IP monitoring.
- H. Each Circuit Monitor shall have built-in data communications to allow multipoint communication to multiple computer workstations, programmable controllers, and other host devices, at a minimum data rate of 9600 baud.
- I. The data communications shall be optically isolated to provide reliable operation.
- J. Provide all programming for integration with the Bacnet IP building management system.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

- A. Install switchboard in accordance with manufacturer's written guidelines, the NEC, and local codes.

3.03 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.

3.04 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 permanent identification for low voltage, control, metering, and instrumentation terminal blocks and individual terminals.

3.05 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.

3.06 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.

3.07 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 2416

PANELBOARDS

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 REFERENCED STANDARDS

- A. NEMA PB 1 - Panelboards
- B. NEMA PB1.1 - Instructions for Safe 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.

1.05 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.

1.06 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.

1.07 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. Cutler Hammer.

1.08 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

2.01 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 and 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, 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 a 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. rated 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 ampere 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 galvanized 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 continuous 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 (1) 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

3.01 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.

3.02 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.

3.03 IDENTIFICATION

- A. Provide engraved panelboard nameplate permanently affixed to the panel door, giving panelboard name designation, system voltage, and name of the panelboard supply source.
- B. Provide a nearly 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.

3.04 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 pullcord in all future conduits with identifying tags on both ends.

3.05 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 or provide new breakers as required to insure branch circuit breakers are proper type and properly rated for the loads finally connected.

3.06 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.

3.07 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 2716

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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

1.04 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

2.01 ACCEPTABLE MANUFACTURERS

- A. Square D
- B. Cutler Hammer

2.02 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

3.01 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.

3.02 PREPARATION

- A. Carefully measure and lay out exact locations.
- B. Provide supports.

3.03 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.

3.04 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.

3.05 ADJUSTMENT AND CLEANING

- A. Adjust trims and doors for vertical and horizontal alignment.
- B. Clean surfaces to be painted.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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

2.01 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.

2.02 INDUSTRIAL GRADE DEVICES

- A. Shall be equal to the devices listed below.
- B. Switches
 - 1. Single pole wall toggle, P&S PS20AC1.
 - 2. Three way wall toggle, P&S PS20AC3.
 - 3. Four way wall toggle, P&S PS20AC4.
 - 4. Single pole key toggle, P&S PS20AC1KL.
 - 5. Three way key toggle, P&S PS20AC3KL.
 - 6. Four way key toggle, 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.
 - 3. 250V, 20A, 6-20R, Simplex, Leviton 5461, P&S 5871.
 - 4. 250V, 20A, 6-20R, Duplex, Leviton 5462, P&S 5862.
 - 5. 125V, 30A, 5-30R, Simplex, Leviton 5371, P&S 3802.
 - 6. 250V, 30A, 6-30R, Simplex, Leviton 5372, P&S 3801.
- 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.
 - 3. 125/250V, 20A, L10-20R, Simplex, Leviton 2360. P&S L1020R.
 - 4. 125/250V, 20A, L14-20R, Simplex, Leviton 2410. P&S L1420R.
 - 5. 125V, 30A, L5-30R, Simplex, Leviton 2610. P&S L530R.

- E. Tamper Resistant Receptacles
 - 1. 125V, 20A, 5-20R, Duplex, Commercial grade, Leviton 5362-IG. Equal by P&S.
- F. Isolated Ground Receptacles
 - 1. 125V, 20A, 5-20R, Duplex, Industrial grade, Leviton 5362-IG. P&S 1G5362.
- G. GFCI Receptacles
 - 1. 125V, 20A, 5-20R, Duplex, Commercial Grade, Leviton 7599. P&S 1595.

2.03 DECORA DEVICES

- A. Shall be equal to the devices listed below.
- B. Switches
 - 1. Single pole wall toggle, P&S 2621.
 - 2. Three way wall toggle, P&S 2623.
 - 3. Four way wall toggle, P&S 2624.
- C. Straight Blade Receptacles
 - 1. 125V, 20A, 5-20R, Simplex, Leviton 16351. P&S 26361.
 - 2. 125V, 20A, 5-20R, Duplex, Leviton 16362. P&S 26352.
- D. Isolated Ground
 - 1. 125V, 20A, 5-20R, Duplex, Isolated Ground, Leviton 16362-IG. P&S 26262.

2.04 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.

2.05 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

3.01 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.

3.02 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.
- D. Unless noted otherwise, all receptacles connected to a supply from a standby generator source shall be red color.
- E. Unless noted otherwise all receptacles connected to a supply from an uninterruptible power system source shall be orange color.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 REFERENCE STANDARDS

- A. NEMA FU1 Low Voltage Cartridge Fuses
- B. UL 248 Low Voltage Fuses

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's bulletins, and minimum melting and total clearing time charts for each type of fuse.

1.06 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.

1.07 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

1.08 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

2.01 FUSES - ABOVE 600A

- A. Fuses shall be time-delay and shall hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less, with an interrupting rating of 200,000 amperes RMS symmetrical, and be listed by a nationally recognized testing laboratory.
- B. Peak let-through currents and I^2t let-through energies shall not exceed the values established by UL for Class L fuses.

2.02 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 200,000 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.

2.03 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.

2.04 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

3.01 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.

3.02 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 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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

1.05 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.

1.06 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.

1.07 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. Cutler Hammer.

1.08 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

2.01 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 indicated on 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

3.01 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.

3.02 PREPARATION

- A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

3.03 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 lamicaid name plate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.

END OF SECTION

SECTION 26 4313

SURGE SUPPRESSION DEVICES

PART 1 - GENERAL

1.01 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.

1.02 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

1.03 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.

1.04 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

1.05 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

1.06 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.

1.07 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. Cutler Hammer.
 - 3. Advanced Protection Technologies.

1.08 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

2.01 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:
 - 1. For 120/208 volt systems, 700 volts L-N, L-G, N-G and 1200 volts L-L.
 - 2. For 277/480 volt systems, 1200 volts L-N, L-G, N-G and 1800 volts L-L.
- C. The Maximum Continuous Voltage Rating (MCOV) shall be not less than 115% of the nominal system operating voltage.
- D. The I-Nominal rating shall be not less than 20 KA.
- E. The units shall have not more than 10% deterioration or degradation of the VPR due to repeated surges.
- F. The attenuation of the EMI/RF1 filter shall be a minimum of -50dB at 100KHz in accordance with UL1283.

2.02 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.

2.03 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.

2.04 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.

2.05 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.

2.06 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

3.01 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.

3.02 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 5100

LIGHTING

PART 1 - GENERAL

1.01 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.

1.02 DESCRIPTION

- A. Work Included: Provide lighting fixtures, lamps, and accessories for interior and exterior illumination of the building.

1.03 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.
- D. Design Criteria: Poles and standards for exterior lighting shall be designed for 100 miles per hour wind loading in accordance with American Association of State Highway and Transportation Officials published procedure.

1.04 REFERENCE STANDARDS

- A. Underwriters' Laboratories No. 57 - Fixtures, Electric Lighting.
- B. Underwriters' Laboratories No. 1570 - Fixtures, Fluorescent Lighting.
- C. Underwriters' Laboratories No. 1572 - Fixture, High Intensity Discharge Lighting.
- D. Underwriters' Laboratories No. 1571 - Fixtures, Incandescent Lighting.
- E. Underwriters' Laboratories No. 935 - Ballasts, Fluorescent Lamps.
- F. Underwriters' Laboratories No. 1029 - Ballasts, High Intensity Discharge Lighting.
- G. Underwriters' Laboratories No. 924 - Emergency Lighting and Power Equipment.
- H. Certified Ballasts Manufacturers Association - Lamps and Ballasts Combinations Safety and Performance Standards.

1.05 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.; Certified Ballasts Manufacturers, and Electrical Testing Laboratories affixed to each item of material.

1.06 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.

1.07 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.

1.08 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

2.01 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 number of ballasts to accommodate switching schedule, ballast voltage for the branch circuit supply, ceiling trim and mounting means for the ceiling material.
 - 4. Fixtures that utilize double ended lamps and contain ballasts that can be services in place shall have a disconnecting internal to each fixture.
 - 5. LED Source Package Lamps:
 - a. LED source packages, arrays or modules and power supplies shall be tested in accordance with LM-79-08.
 - b. 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.
 - c. LED lamp color temperature of 4000K with minimum 80% CRI is required for LED lamps. Lamp lumen minimum values as scheduled.
 - d. Luminaire power factor shall be minimum 90%.
 - 6. LED Power Supplies / Drivers:

- a. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
 - b. 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.
 - c. Shall have short circuit and overload protection.
 - d. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°F
 - e. Power supply output shall be regulated to ±5% across published load range.
 - f. Shall have as Class A sound rating.
 - g. 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.
 - h. Shall contain no PCBs.
 - i. 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%.
 - j. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.
- B. Emergency Battery Ballast Units
- 1. Selected to operate the lamp and ballast combination for the specific light fixture for a minimum of 90 minutes at not less than 1100 initial lumens for one lamp.
 - 2. Include nickel-cadium battery, charger, and inverter for either switched fixture or unswitched fixture operation.
 - 3. Include status indicator light, to monitor charger, fault condition and battery and test switch.
 - 4. Include controls for automatic self-test for 30 seconds every 30 days and for 90 minutes once per year, with audible and visual signal to indicate test result.
 - 5. For switched fixture installations, provide unswitched branch circuit conductor to the fixture from the same branch circuit serving the area.
- C. 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

3.01 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.

3.02 PREPARATION

- A. Verify ceiling material 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 outlet boxes and conduit.

- D. Do not support light fixtures from the ceiling system if the weight of the fixture causes the total dead load to exceed the ceiling system design load or deflection specification. In such cases, light fixtures shall be supported by supplementary hangars located within 6 inches of each corner, or supported independently from the structure.
- E. Where existing fixtures are required to have ballasts replaced, fixtures that utilize double ended lamps shall be provided with a disconnecting means internal to each fixture.

3.03 INSTALLATION

- A. Provide lighting fixtures, lamps, switches, and 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. Prepare fixtures, trim, and poles and standards required to be painted.
- H. Note: Outlet boxes locations on drawings are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knockouts.
- I. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.
- J. Where 0-10 volt dimming is called for, provide 0-10 volt dimming conductors to each fixture.
- K. For fixtures noted to be integrated with a spate emergency lighting system, coordinate all requirements with the emergency lighting system manufacturers, and provide required optional components for proper operation with such system.

3.04 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.

3.05 FOUNDATIONS

- A. For exterior lighting ground mounted fixtures or poles, provide concrete foundations with steel reinforcing designed in accordance with AASHTO Standards referenced herein and as shown on the drawings.
- B. Provide 1/2" x 8 ft. copper clad ground rod adjacent to each concrete foundation.
- C. For each concrete foundation, provide #6 AWG bare copper conductor from the copper weld ground rod up to a connection at the pole grounding lug. Provide cadweld connection between the #6 AWG bare copper conductor and the ground rod.
- D. Provide two (2) 1" spare conduits stubbed out from each pole foundation for security system requirements.

3.06 LIGHTING FIXTURE SCHEDULE

- A. Reference drawings for Lighting Fixture Schedule.

END OF SECTION

SECTION 27 05 00

GENERAL COMMUNICATION SYSTEMS REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Communication Systems complete including modification of existing systems to be revised and expanded, cabling, special backboxes, hardware and all other required devices and equipment.
- C. Installation of system equipment per specifications.
- D. To supply in a timely manner to the electrical contractor special backboxes for installation as required.
- E. Coordinate wireway, raceway, power, and outlet requirements with the builder and the electrical contractor.
- F. Communication Systems Contractors shall provide and install prior to cable installation plastic snap in bushings at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves to protect the cabling from damage.
- G. Furnishing of all required materials, equipment, tools, scaffolding, labor, and transportation necessary for the complete installation of the communication systems as shown on the drawings and as specified herein.
- H. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.
- I. It is the intent of these specifications to provide complete installations although every item necessary may not be specifically mentioned or shown.

1.2 WORK TO BE INCLUDED BY THE ELECTRICAL CONTRACTOR IN BASE CONTRACT PROPOSAL

- A. Provide utility services conduit as outlined on drawings as required.
- B. All required conduit for accessibility to attic space.
- C. Furnishing and installation of all required standard back boxes and conduit.
- D. Installation of special back boxes supplied by the Division 27 contractor(s).
- E. Furnishing and installation of all floor boxes, surface raceways, and other wireways which are detailed or specified under Division 26.
- F. Provide equipment-mounting boards as outlined on drawings.
- G. Provide equipment grounding system, conductors, and bus bars and as outlined in Division 26.

- H. Provide 120-volt power and hook-up to equipment provided in Division 27.
- I. Coordination of requirements of Division 27 with the Builder.

1.3 WORK NOT INCLUDED

- A. Contractors shall make no agreement that obligates the Owner to pay any company providing communications, monitoring, or other services. Contractors shall not make selection, purchase, or installation of interconnect instruments/equipment to be used on this project.

1.4 RELATED SECTIONS

- A. The conditions of the Division 0, Division 1, Division 26 requirements, and the contract requirements that include the General Conditions and the Supplementary Conditions apply to work of this division.
- B. Section 26 05 34 - Provisions For Communication, Security, and Safety Systems.

1.5 OWNER FURNISHED CONTRACTOR INSTALLED (OFCI) EQUIPMENT

- A. The contractor shall verify that new and existing products and site conditions are satisfactory for installation or relocation of OFCI equipment. If unsatisfactory conditions exist or other discrepancies are identified, the contractor shall immediately document the conditions and notify the owner in writing.
- B. The contractor shall coordinate all required equipment schedule quantities and any dimensions or variations required to adapt to field conditions with the owner at the earliest possible date.
- C. The contractor shall verify compatibility, installation rough-in, mounting, and utility requirements for the scheduled OFCI equipment.
- D. The owner shall coordinate delivery dates with the builder to meet the construction schedule.
- E. The installation of items as identified in the plans and specifications as OFCI equipment shall conform to the provisions of the Contract Documents and shall be coordinated with the builder.
- F. Installation shall be performed by competent and trained workers in accordance with all applicable codes and governing regulations.
- G. Installation, testing, and startup shall comply with the manufacturer's instructions.
- H. The contractor shall provide all miscellaneous hardware, structural support, cabling, fittings, etc. that is not included by the manufacture, but required for installation.
- I. The contractor shall clean and adjust all relocated and new OFCI products as necessary.
- J. All crating, packing materials, and debris and shall be properly disposed of off-site.
- K. Installation shall be subject to inspection by the architect, engineer, owner, and builder. The installer shall not proceed until any unsatisfactory conditions are corrected. Any damage caused by improper handling or installation procedures shall be corrected at no cost to the owner.

- L. For drop shipped equipment, the builder shall be the consignee and shall have a representative on site for coordination of delivery, to receive shipments, and to inspect each shipment for obvious signs of damage or shortages. The builder shall be responsible for all shipping damage claims, including hidden damage, refusal of shipment, and Return Authorization procedures. The builder shall provide secure storage, handling, and protection from the elements, prior to the contractors' acceptance for installation.
- M. For equipment stored at an owner's facility, the contractor shall load the equipment and provide transportation to the work site. Prior to loading, the contractor shall inspect the equipment for obvious signs of damage and document all quantities, noting shortages from the project requirements, indicating acceptance of the merchandise as is and in good order.
- N. The contractor shall conduct and properly document testing of all installed equipment to verify proper operation. When appropriate, on site operation and maintenance instruction shall be provided to the owner's personnel. This instruction shall include demonstration of proper use, maintenance, and cleaning procedures.
- O. The nature of the equipment procurement shall determine responsibility for resolving any claims with the manufacturer or supplier relating to defects in material or workmanship and warranty claims. The party that purchased the equipment shall resolve these issues.

1.6 CODES, STANDARDS, AND THEIR ABBREVIATIONS

- A. General:
 - 1. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
 - 2. In addition to the requirements outlined in other sections of the specifications the following standards are imposed as applicable to the work in each instance:
 - a. OSHA Safety and Health Regulations for Construction.
 - b. NFPA No. 70 National Electrical Code.
 - c. NESC National Electrical Safety Code, ANSI Standard C2.
 - d. NEIS National Electrical Installation Standards.
 - e. Local Codes and Ordinances.
- B. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's responsibility to perform the work in accordance with the local code prevailing and local interpretations thereof. Any such additional work shall be performed at no additional cost to the Owner.
- C. Materials and components shall be UL listed and labeled by Underwriters Laboratories, Inc. for the intended use under the latest appropriate testing standard.
- D. The Contractor shall obtain all permits required to commence work and, upon completion of the Work, obtain and deliver to the Owner's Representative a Certificate of Inspection and Approval from the State Board of Fire Underwriters, the City of Midlothian, Texas, and other authorities having jurisdiction. The Contractor shall pay required permit fees.

1.7 LIST OF ASSOCIATIONS AND STANDARDS:

ADA:	Americans with Disabilities Act.
ANSI:	American National Standards Institute, 1430 Broadway; New York, NY 10018.
ASTM:	American Society for Testing and Materials, 1916 Race Street; Philadelphia, PA 19103.
BICSI:	(RCDD5 Standards), 8610 Hidden River Parkway, Tampa, FL 33637

CBM:	Certified Ballast Manufacturers Association, 2116 Keith Building; Cleveland, Ohio 44115.
IEEE:	Institute of Electrical and Electronics Engineers, 345 East 47th Street; New York, NY 10017.
ICEA:	Insulated Cable Engineers Association, P.O. Box P, South Yarmouth, MA 02664.
NEC:	National Electrical Code; NFPA No. 70.
NECA:	National Electrical Contractors Association, Inc., 7315 Wisconsin Ave.; Washington, DC 20014.
NEMA:	National Electrical Manufacturers Association, 155 East 44th Street; New York, NY 10017.
NESC:	National Electrical Safety Code, ANSI Standard C2.
NFPA:	National Fire Protection Association, 60 Batterymarch Street; Boston, MA 02110.
OSHA:	Occupational Safety and Health Administration, US Department of Labor; Washington, DC 20402.
TAS:	Texas Accessibility Standards (TAS) Article 9102.
UL:	Underwriters Laboratories, Inc., 333 Pfingsten Road; Northbrook, IL 60062.

- A. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.
- B. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.
- C. The date of the code or standard is that in effect on the date of issue stated on the contract documents, except when a particular publication date is specified.
- D. The Contractor shall comply with all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting any deficiencies due to non-compliance.
- E. Where local codes and ordinances are not in writing or on record but local precedence have been set, the Owner shall pay for any additional resulting cost.

1.8 DEFINITIONS

- A. Approval: It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work. Approval by the Architect of any changes, submitted by the Contractor, will be considered as general only to aid the Contractor in expediting his work.
- B. The Builder: The primary contractor engaged to oversee the construction project. They may be technically described as a Construction Manager, General Contractor, Managing Construction Contractor, et cetera.
- C. The Contractor: The Contractor engaged to execute the work included a particular section only, although he may be technically described as a Subcontractor to the Builder. If the Contractor, engaged to execute said work, employs Sub-Contractors to perform various portions of the work included under a particular Section, they shall be held responsible for the execution of this work, in full conformity with Contract Document requirements. The Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various sections and phases of work may be properly coordinated without unnecessary delays or damage.
- D. The Electrical Contractor: The Electrical Contractor shall be engaged to execute the work included Division 26 only.

- E. PDF file or .pdf: The filename extension associated with “Portable Document Format” files, which are multi-platform computer files in the ISO 32000-1:2008 open standard format developed and licensed by Adobe Systems. These files are a digital electronic representation of text, documents, images, and technical drawings in a font and color-accurate fixed-layout format that is platform and display resolution independent. PDF files can be electronically transmitted, viewed, or printed with various free PDF reader application programs, and may allow markups/comments with various PDF editing application programs.
- F. Provide: Defined as requiring both the furnishing and installation of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.9 SCHEDULE OF VALUES, APPLICATION FOR PAYMENT

- A. The Contractor shall in accordance with the General Provisions of the Contract, including General and Supplementary Conditions, and Division 1, complete a Schedule of Values and Applications for Payment. When a portion of this work separately funded, including donations or an E-Rate program, the contractor shall accommodate this in the Schedule of Values and Applications for Payment. For E-Rate eligible portions of this work, the contractor will be required to participate in the E-Rate program, comply with all E-Rate regulations, and provide billing as needed. The contractor shall coordinate with the Owner to file Form 471 or latter edition and/or other forms as may be required.

1.10 WARRANTY

- A. The Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.
- B. Neither the final payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.
- C. He shall remedy any defects due thereto, and pay for any damage to other work resulting there from, which shall appear within a period of one year from date of substantial completion.
- D. The Owner shall give notice of observed defects with reasonable promptness.
- E. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.11 SITE VISIT

- A. Before submitting a proposal, each proposed contractor shall examine all plans and specifications relating to the work, shall visit the site of the project, and become fully informed of the extent and character of the work required, including all required utilities.
- B. No consideration will be granted for any alleged misunderstanding of the materials to be furnished or the amount of work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying plans or required by nature of the site of which may be fairly implied as essential to the execution and completion of any and all parts of the work.

1.12 SUBMITTALS

- A. Submittal procedures shall be per Division 1 - General Requirements.
- B. Provide a complete submittal for each section as specified.

- C. Submit complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- D. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- E. Each Product data submittal shall include:
 - 1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
 - 2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 - 3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
 - 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 - 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 - 6. When the contract requires extended product warranties, submit a sample of warranty language.
 - 7. Any resubmittal shall include a complete revised equipment list and any product data that is revised.
- F. Submit shop or coordination drawings, when specified or the required for the scope of work, which include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.
- G. The Engineer's review of submittals is only for confirmation of adherence to design of project and does not relieve the Contractor of final responsibility for furnishing all materials required for a complete working system and in complying with the Contract Documents in all respects.

1.13 PROJECT RECORD DOCUMENTS

- A. 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.
- B. Upon submitting his request for final payment, he shall turn over to the Architect/Engineer, for subsequent transmittal to the Owner revised plans showing "as installed" work.
- C. In addition to the above, the Contractor shall accumulate during the jobs progress the following data in PDF file format (preferred) or paper copies to be turned over to the Architect/Engineer for checking and subsequent delivery to the Owner:
 - 1. All warranties, guarantees, and manufacturer's directions on equipment and material covered by the Contract.
 - 2. PDF file or paper copies of all Shop Drawing prints and CAD or BIM engineering drawing program files.

3. Any software programs, data/programming files, passwords, special interface cables, or keys that may be needed to maintain or access equipment.
4. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
5. Any and all other data and/or plans 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. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
 - a. Builder and all Contractors.
 - b. Major Equipment Suppliers
 - c. Submit communication systems warranties.

1.14 TRAINING

- A. Upon completion of the work and at a time designated by the Architect, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all communication systems equipment and systems.
- B. See other sections for time requirements.

1.15 PLANS AND SPECIFICATIONS

- A. The intent of the project drawings is to establish the types of systems and functions, but not to set forth each item essential to the functioning of the system.
- B. Electrical drawings are generally diagrammatic and show approximate location and extent of work.
- C. Install the work complete including minor details necessary to perform the function indicated. Provide communication systems (including all hook-ups) complete in every respect and ready to operate.
- D. If clarification is needed, consult the Architect/Engineer.
- E. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies occur between drawings, specifications, and actual field conditions, immediately notify the Architect/Engineer for his interpretation.
- F. The Architect/Engineer reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

1.16 PRODUCT SUBSTITUTIONS

- A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose systems which differ in manufacturer, features, functions, or operating characteristics from those outlined in these specifications must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.

- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified and include relevant technical and cost data. This shall include a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.
- D. The Engineer will consider all such submittals and the Architect will issue an addendum listing items that the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.
- E. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of the alternate system shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically ensure the system will be an acceptable equivalent.
- F. The Contractors' proposal represents that the contract proposal price is based solely upon the materials, equipment, and labor described in the Contract Proposal Documents (including addenda, if any) and that he contemplates no substitutions or extras.
- G. The manufacturer of the proposed substitute unit shall provide samples for evaluation, when required, at no charge and non-returnable.
- H. Requests for substitution are understood to mean that the Contractor:
 - 1. Has personally investigated the proposed substitution and determined that it is equivalent or superior in all respects to that specified.
 - 2. Will provide the same guarantee for the substitution that he would for that specified.
 - 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.
 - 4. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances:
 - a. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
 - b. The specified product is unavailable through no fault of the Contractor.
 - c. The manufacturer refuses to warranty the specified products as required.
 - d. Subsequent information indicates that the specified product is unable to perform properly or to fit in the designated space.
 - e. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.
 - f. Revisions to the electrical system caused by substitutions shall be under the supervision of the Engineer, at a standard hourly rate charged by the Engineer. Charges from the Engineer, Architect, and Electrical Contractor shall be paid by the Contractor originating the changes.

1.17 FUTURE USE CABLING

- A. When cabling is installed for future use, it shall be identified with a tag of sufficient durability to withstand the environment involved.
- B. Locations and Existing Conditions:
 - 1. Location and condition of any existing equipment or services, when shown, have been obtained from substantially reliable sources, are shown as a general guide only, without guarantees as to accuracy.

2. The Contractor will examine the site, verify all requirements, service points, and availability of all services required to complete this project. No consideration will be granted for any alleged misunderstanding of the materials and labor to be provided as necessitated by nature of the site including those items that may be fairly implied as essential to the execution and completion of any and all parts of this project.

1.18 EXAMINATION

- A. Verify field conditions including existing systems, equipment models, configurations, circuiting arrangements, cabling, and devices. Adjust all circuiting, cabling, and materials to be provided as required by job conditions.
- B. Project drawings are based on casual field observation and existing record documents when available, report any significant discrepancies to the Engineer before disturbing existing systems.
- C. The Contractor accepts the existing conditions when beginning demolition.

1.19 IMPLEMENTATION

- A. Verify phasing in regard to systems and coordinate before energizing any system.
- B. When required during phases of construction to maintain existing systems in service in particular areas, provide temporary wiring and connections as necessary to accommodate construction.

1.20 OPERATION OF NEW EQUIPMENT PRIOR TO PROJECT COMPLETION

- A. When the phasing of a project requires that communication systems are operable in certain areas and the Owner needs to operate the equipment the contractor shall make such provisions. The warranty period shall commence on new equipment when it is operated for the beneficial use of the Owner. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, properly adjust, and complete all punch list items before final acceptance by the Owner. In these cases, the date of acceptance and the start of the warranty may be different dates.

1.21 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment in areas of renovation that are to remain or be reused.

1.22 PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Contractor shall take such precautions as may be necessary to protect his apparatus from damage.
- B. This shall include the creation of all required temporary shelters to protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering.
- C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by the Contractor.

1.23 FINAL OBSERVATION

- A. It shall be the duty of the Contractor to make a careful observation trip of the entire project, assuring themselves that the work on the project is ready for final acceptance before calling upon the Architect/Engineer to make a final observation.
- B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, et cetera, called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of said final observation. The Contractor is cautioned to check over each bond, receipt, et cetera, before preparing for submission to verify that the terms check with the requirements of the specifications.
- C. The following and other provision of Division 1 General Conditions will be required at time of final completion:
 - 1. Final clean up completed.
 - 2. All systems are fully operational, all material and devices installed.
 - 3. As built (as installed) drawings and operations manuals.

1.24 PROHIBITED MATERIALS

- A. No new asbestos, lead, or materials containing these substances shall be permitted in this project. The Contractor shall consult the Architect concerning these materials if their presence is suspected. All work in or around existing asbestos or lead materials is at the sole risk of the Contractor and his personnel.

1.25 CUTTING AND PATCHING

- A. Notify the Builder sufficiently ahead of construction of any floors, walls, ceiling, roof, et cetera, of any openings that will be required for his work.
- B. The Contractor shall see that all sleeves required for his work are set at proper times to avoid delay of the job.
- C. All necessary cutting of walls, floors, partitions, ceilings, et cetera, as required for the proper installation of the work under this Contract shall be done at the Subcontractor or at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the Architect/Engineer.
- D. Patching of openings and/or alterations shall be provided by the communications Subcontractor or at the Subcontractor's expense in an approved manner.
- E. No joists, beams, girders, or columns shall be cut by any Contractor without first obtaining written permission of the Architect/Engineer.
- F. All openings in firewalls and floors shall be completely sealed after installation for a completely airtight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.
- G. All openings in exterior walls shall be sealed watertight.
- H. Seal voids around conduits penetrating fire-rated assemblies and partitions using fire stopping materials and methods in accordance with NFPA and local codes.

1.26 MANUFACTURERS' INSTRUCTIONS

- A. All equipment and devices shall be installed in accordance with the drawings and specifications, manufacturer's instructions, and applicable codes.
- B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions.
- C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

1.27 INSTALLATION

- A. Cooperation with trades of adjacent, related or affected materials or operations, and or trades performing continuations of this work under subsequent contracts are considered a part of this work. In order to effect timely and accurate placing of work and to bring together, in the proper and correct sequence, the work of such trades, including work provided under a Division 1 allowance.
- B. The Communications Contractor shall coordinate installation of the communication systems with the Builder, Electrical, Mechanical, and Plumbing Contractors to ensure a complete working system for the Owner.
- C. Where required for accessibility all conduit and boxes for all communication systems shall be provided by the Electrical contractor as specified, including systems in Division 27, any and all allowances shall be included. Normally low voltage wiring shall run open and supported in accessible attic space. All low voltage wiring in exposed areas such as gyms, stages, shops, and field houses shall be enclosed in conduit. Coordinate with, and verify with Division 26 to provide required conduit and boxes at locations and heights as required.
- D. Conduit, innerduct, track, or raceway shall conceal and protect wiring in exposed areas, within walls, through in- accessible areas, floors, chases, under slab, crawlspaces, or underground.
- E. All conduit, duct, track, and raceway runs shall be spaced apart to allow for maintenance, such as the installation of couplings, without disturbing adjacent pathways.
- F. All work must be performed by workers skilled in their trade. The installation must be complete whether the work is concealed or exposed.
- G. Provide stainless screw/bolt hardware wherever stainless devices are used and in potentially wet areas.
- H. Coordinate the actual locations of devices and outlets and equipment with building features and mechanical equipment as indicated on architectural, structural, and mechanical drawings. Review with the Architect any proposed changes in outlet or equipment location. Relocation of devices, before installation, of up to 3 feet from the position indicated, may be directed without additional cost. Remove and relocate outlets placed in an unsuitable location when so requested by the Architect.

1.28 ADDITIONAL MATERIALS: INCLUDE IN THE BASE CONTRACT PROPOSAL

- A. All costs to provide 5 additional communication voice and/or data outlet locations including all cable and devices as directed by the Architect. Conduit and standard back boxes by Division 26 Electrical Contractor.

PART 2 - PRODUCTS

- A. Not Applicable

PART 3 - EXECUTION

- A. Not Applicable

END OF SECTION

SECTION 27 10 30

DATA AND TELEPHONE CABLE PLANT

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation and testing of a complete data (computer network) and telephone cable plant providing all permanent premise cabling and wiring devices required to support a facility wide computer network system and telephone system and as shown or indicated on the drawings and/or as specified.
- C. All other electronic equipment, telephone-switching units and cross connect; telephone sets, network switching equipment, transceivers, routers, network interface cards, computers, and software are not included in this section.
- D. It shall be the responsibility of the Electrical Contractor to provide and install all conduit systems, standard boxes, ground bus bars (See Section 26 05 34), and operating power for the data and telephone cable plant as outlined on the project drawings. The Data and Telephone Cable Plant Contractor shall coordinate all system requirements with and provide any special back boxes to the Electrical Contractor prior to installation of conduit.
- E. The station (horizontal) cabling shall extend from each designated data and telephone jack to the nearest IDF or the MDF in a star topology.
- F. The MDF (Main Distribution Frame) shall be connected by the data backbone cabling to each IDF (Intermediate Distribution Frame) in a star pattern. Each data backbone run shall be a 12-strand armored single mode fiber optic cable and a 12-strand armored OM4 multi-mode fiber optic cable .
- G. Conduct spool Testing, as described in Part 3, for all requirements shall be performed on all cable spools before installation.
- H. Conduct final testing, as described in Part 3, for all requirements shall be performed with all labeling, cable, supports, wiring devices, and connectors in place. The cable shall not be disturbed for any reason after successful final testing. A certification report shall be provided for each cable run.
- I. Provide all documentation and training as outlined in these specifications.
- J. Provide an extended warranty as outlined in these specifications.

1.2 RELATED SECTIONS

- A. Section 26 05 34 - Provisions for Communication, Security, and Safety Systems.
- B. Section 27 05 00 - General Communication Systems Requirements.

1.3 CODES AND REGULATIONS

- A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
- B. The equipment, materials, and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:
 - 1. NFPA 70, National Electrical Code.
 - 2. NFPA 101, Code for Safety to Life from Fire in Buildings and Structures.
 - 3. ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 4. ANSI/IEEE Standard 802.3, also known as ISO 8802-3 - Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Ethernet UTP 10 Base-T, Fiber Optic 10 Base-FX.
 - 5. ANSI/TIA/EIA-568-3 Commercial Building Telecommunications Cabling Standard.
 - 6. ANSI/TIA/EIA-568-B.2-10:2008 Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cabling.
 - 7. ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard.
 - 8. ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 9. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - 10. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 11. CENELEC EN 50289-1-14 Coupling attenuation or screening attenuation of connecting hardware.
 - 12. DIN IEC 60068 Basic environmental testing procedures.
 - 13. EIA-364 Electrical Connector/Socket test Procedures Including Environmental Classifications.
 - 14. IEC 60603-7-51. Ed. 1.0 Detailed specification for 8-way, shielded free and fixed connectors, for data transmissions with frequencies up to 500 MHz
 - 15. IEEE 802.3-2002 Information Technology - Telecommunication & Information Exchange Between Systems - LAN/MAN - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
 - 16. IEEE 802.3ae IEEE Standard for Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications-Media Access Control (MAC) Parameters, Physical Layer and Management Parameters for 10Gig Operation.
 - 17. IEEE 802.3an Physical Layer for 10Gig (10GBASE-T) operation over balanced twisted pair structured cabling systems
 - 18. IEEE Standard 802.3u Fast Ethernet UTP 100 Base-Tx, 100 Base-T, 100 Base-T4, Fiber Optic 100 Base-FX.
 - 19. ISO / IEC 60603-7-1 First Edition. 2002 Detailed Specification for 8-way, shielded free and fixed connectors with common mating features
 - 20. ISO/IEC 11801 ed. 2.1 Amd 2:2008 Information Technology - Generic Cabling for Customer Premises
 - 21. TIA/EIA TSB 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
 - 22. TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard
 - 23. Universal Service Ordering Code (USOC).
 - 24. All applicable parts will be Underwriters Laboratories, Inc. approved.
 - 25. All applicable parts will be FCC Class B approved.
 - 26. International Building Codes (IBC).
 - 27. Americans with Disabilities Act.
 - 28. Texas Accessibility Standards.
 - 29. Local and State Building Codes.

30. All requirements of the local Authority Having Jurisdiction (AHJ).

1.4 SUBMITTALS

- A. Submittal procedures: See Section 27 05 00.
- B. Submit a complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- C. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- D. Quality Assurance Submittal: The Contractor must be a certified Integrator/Installer authorized by **Panduit and General** (the Manufacturers) to provide a **PanGen Plus Structured Cabling System 25-year Warranty (no exceptions)** to the Owner covering all network cable and connectivity hardware products comprising this installation site. The Contractor and Manufacturer shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship for a period of twenty-five (25) years from the date of substantial completion. Provide a copy of contractor certification to provide a **PanGen Structured Cabling System** and sample warranty text. Midlothian ISD, Midlothian, Texas, will only accept and award projects to local certified **Panduit One Partners** with current **Platinum Status** and an active deploy competency certificate.
- E. Product Data Submittal including special boxes, cable, and other material as requested by the Architect including:
 - 1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
 - 2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 - 3. A product data index and complete equipment list including for each product submitted for approval the manufacturer's name and part number, including options and selections.
 - 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 - 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 - 6. Submit a sample of the extended product warranty language.
 - 7. Any resubmittal shall include a complete revised equipment list and any product data that is revised.
- F. Submit shop drawings locating all components of the system. Shop or coordination drawings shall include information that will allow the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.

1.5 QUALIFICATIONS OF A PROPOSED CONTRACTOR

- A. Proposed contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein described will be disqualified.
- B. The proposed contractor shall be a local certified **Panduit One Partner** with current **Platinum Status** and an active deploy competency certificate.
- C. The proposed contractor, as a business entity, shall be an authorized distributor and designated representative of the equipment manufacturer, with full extended warranty privileges. The proposed contractor shall have been actively engaged in the business of selling, installing, and servicing commercial building commercial cable systems for a period of at least 5 years.
- D. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.
- E. The proposed contractor shall have an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period. The contractor shall be capable of dispatching technicians to repair a system within six hours of a service request.
- F. The proposed contractor shall be fully experienced in the design and installation of the type of system herein specified, and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.
- G. The contractor shall employ factory-trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the contractors' submittal.
- H. The proposed contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A proposed contractor that has any prior finding(s) of a code violation or has any litigation in process concerning the installation of a cable plant is unacceptable.
- I. The ability of a proposed contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the contractors' competency and responsibility to meet the requirements and obligations of the contract.
- J. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.

- K. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed contractor shall furnish to the Owner with any information or data requested for this purpose.
- L. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.
- M. The Owner reserves the right to reject the proposal of any contractor who has previously failed to perform properly, or complete on time, contracts of a similar nature.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All cable and wiring devices provided shall be listed and labeled by Underwriters Laboratories, Inc. for the intended use under the latest appropriate testing standard.
- B. Label the cable run designator on both ends of all cables, patch panel jacks, termination cabinet connectors, and all jack wall plates and housings. In addition, label the cable run designator(s) on the ceiling grid bar at jack locations that are concealed above a drop ceiling; including those for wireless access points, cameras, projectors, etc. Labels shall be polymer film Turn-Tell flexible non-smear, or equivalent, machine printed labels complying with EIA/TIA 606 standards. Utilize a Panduit PanTher LS8EQ Printer with R Series Turn-Tell labels, or equivalent.
- C. Only equipment devices have been shown on the contract drawings. Specific wiring between equipment has not been shown.
- D. All equipment and components shall be new, and the manufacturers' current model. All like devices shall be of the same manufacturer and model number.
- E. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., cable shall not be supported by or lay on suspended ceilings). Fasteners and supports shall be adequate to support the required load.
- F. Installation subject to approval, inspection, and test of the Architect/Engineer.

2.2 SPECIAL REQUIREMENTS FOR CATEGORY 6A CABLE DROPS

- A. The Category 6A standard covers several variations including UTP unshielded and F/UTP F/FTP shielded/grounded cabling and connectivity, however nothing in this specification should be misconstrued to indicate that any system other than a U/UTP solution incorporating reduced diameter station (horizontal) cable and connectors with a non-conductive, non-grounded, metallized material tape isolation wrap designed to minimize alien crosstalk would be acceptable.
- B. Category 6: The Augmented Category 6 solution provided shall be a Panduit and General TX6A 10Gig UTP Cabling System, per configuration one (up to 100 meters) and three of the ANSI/TIA-568-C.2 Category 6A standard, and shall be compliant with the IEEE 803.3ae standard for up to 10Gig networking (10GBASE-T Ethernet channel performance). The system shall fully support a network operating at a swept frequency of 500 MHz, with backward compatibility for 10/100/1000Base-T network equipment. The data cable plant shall include station (horizontal) copper data cabling, workstation outlets, racks, patch panels, patch cables, and fiber optic network backbone cabling.

- C. Category 6A: The structured cable system provided shall constitute a Category 6A UTP (also designated U/UTP) (unshielded twisted pair) solution incorporating station (horizontal) cable with a non-conductive, non-grounded, metallized material tape isolation wrap placed directly beneath the outer jacket. The jack modules shall also feature a suppression barrier to provide extended frequency isolation. In addition, the cable system shall support advanced PoE applications at extended operating temperatures. This isolation shall suppress both electric and magnetic coupling between adjacent cables, reducing alien crosstalk, and allowing for a 20% reduction in overall cable diameter in comparison to Category 6A UTP cable without an isolation wrap. The isolation barriers shall eliminate the need for field testing for alien crosstalk.
- D. The lighter, smaller-diameter, lower thermal resistance, Category 6A cable shall enable efficient use of pathway spaces for improved energy efficiency with better airflow through racks and cabinets improving space utilization and thermal management for advanced PoE applications up to 25W per device at extended operating temperatures up to 167°F (75°C).
- E. The contractor shall design and implement the cable pathways and supports to overcome installation and management challenges associated with Category 6A UTP cable as specified herein when compared to Category 3 through 6 UTP cable types. Category 6A UTP is a stiffer cable designed to operate at a high frequency and with higher wattage loads, which will require mitigation of heat dissipation issues.
- F. The former installation practice of tightly routed “combed, dressed, and bundled” cable trunks, which was common with Category 5 cable, is prohibited. Limit UTP cable bundles to 48 cables. Network cables shall be routed with adequate air space and by neatly randomized pathways to ensure adequate airflow. The complete system shall yield overall channel performance in a high-density physical infrastructure environment and shall achieve 10 Gbit/sec performance with minimum alien crosstalk.

2.3 ACCEPTABLE MANUFACTURES

- A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose any product substitution must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.
- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified.
- D. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of any alternate products shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically insure products will be an acceptable equivalent.
- E. It is the responsibility of the Contractor to provide all features and functions as outlined in these specifications. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

- F. The selected contractor must be a certified Integrator/Installer authorized by one of the Manufacturers listed below to provide an extended warranty to the Owner covering all network cable and connectivity hardware products comprising this installation site. All UTP cable, fiber optic cable, and all wiring devices installed shall be products of one approved manufacturer or joint manufacturers program and approved for use in their extended warranty program. The Contractor and Manufacturer shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship; provide a copy of contractor certification.
- G. The manufacturers model numbers, functions, and features described in this specification section are those of the **Panduit and General Cable PanGen Plus 6 and 6A Structured Cabling Solution with a 25 year warranty (no exceptions)** per District standards, no exceptions, and this shall constitute the quality and performance of the equipment to be furnished

2.4 SYSTEM DESCRIPTION

- A. Provide a copper data structured cabling system that meets and exceeds the Category 6 or Category 6A standards as indicated and shall provide improved electrical performance by reducing harmful NEXT and Alien NEXT interference.
 - 1. The Category 6 data network copper cabling system runs shall support up to 1-Gigabit Ethernet using parallel transmission schemes.
 - 2. The Category 6A data network copper cabling system (wireless access point drops only) runs shall support up to 10-Gigabit Ethernet using parallel transmission schemes.
- B. Each jack shall be terminated and mounted in a suitable faceplate for all wall, enclosure, millwork, floor box, modular furniture, etc. locations.
- C. All wall plates shall have machine printed labels meeting EIA/TIA 606 standards inserted behind built-in clear plastic windows, or engraved plastic nameplates permanently attached, indicating cable run identification number(s). Engraved labels shall be 1/16" thick two ply black/white acrylic sheet engraving stock with all sides beveled.
- D. All jacks shall be suitable for data grade use; only the rating, color, icons, and marking cable shall be different.
- E. This system shall allow all the additional equipment required to complete the telephone system and computer network to be plugged in. This specification section does not specify or include any electronic equipment, telephone switching units or cross connect, telephone sets, modular telephone cords, network switching equipment, routers, fiber transceivers, network interface cards, computers, or software that constitute a complete computer network or telephone system.
- F. All jacks shall be shielded 8-pin modular female connectors (RJ-45). All cabling and connectors provided shall meet and be tested to TIA/EIA 568-A Style B, Category 6 or Category 6A/Class E^A requirements.
- G. All Category 6 data, telephone card access, clock, and camera jacks shall be wired with Category 6 copper cable supporting data transmission rates up to 250 MHz Media shall be 4-pair (8-wire), 100 Ω unshielded twisted pair (UTP) cable. All related cabling, terminations and devices shall meet and be tested to Category 6 standards.
- H. All Category 6A wireless access point jacks shall be wired with Category 6A UTP unshielded twisted pair copper cable supporting data a transmission rate of 500 MHz Media shall be 4-

pair (8-wire), 100 Ω unshielded twisted pair (UTP) cable. All related cabling, terminations and devices shall meet and be tested to Category 6A standards.

- I. The cable plant will provide the permanent part of the building wiring (cable plant) required to provide connection for telephones, IP devices, and network computers.

2.5 WALL PLATE COLOR

- A. Color of device/wall plates to best match project light switches and electrical outlets, coordinate with the Electric Contractor.

2.6 COLOR-CODING

- A. Station (horizontal) cabling jackets shall be color-coded as follows:
 1. Blue Category 6 (data).
 2. Green Category 6 (CCTV)
 3. Yellow **Category 6A** (Wireless Access Points)
- B. Patch cords and jacks are to be color coded as follows and the jacks in the patch panels are to be grouped together for each designated color and use:
 1. Blue Data outlets, Category 6.
 2. Green CCTV camera outlets, Category 6
 3. Yellow Wireless outlets, **Category 6A**.

2.7 FIBER OPTIC SYSTEM COLOR CODING

- A. Each type of fiber optic cabling shall feature distinctively colored cabling and jumper connectors:
 1. Any Multimode cabling and jumper connectors shall be Aqua.
 2. Any Single Mode cabling and jumper connectors shall be Yellow.

2.8 CABLE RUN DESIGNATOR LABELING SCHEME

- A. Each patch panel jack, wall plate jack, terminal cabinet connector, and both ends of each cable run shall be labeled with a cable scheme run designator utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels installed according to EIA/TIA 606 standards. Utilize a DYMO Rhino 5200 Label Printer or equivalent. All labeling shall conform to industry standards and best practices.
- B. Labeling types and scheme and shall be verified and coordinated with the MISD Technology department prior to any installation.

2.9 DATA/TELEPHONE CABLING PLAN

- A. Provide adjacent to the equipment rack in each MDF and IDF a plan view of all building areas covered by the equipment closet meeting the following requirements:
 1. Framed and secured to the wall and plan covered with clear acrylic panel.
 2. Size to clearly show all required information.
 3. "YOU ARE HERE" indicator with arrow.
 4. Room names and numbers. Verify with Owner.
 5. Show each device with symbol and identification address number as designated by owner.
 6. Symbol legend.
 7. True north arrow
 8. Scale indicator

2.10 DATA/DESK TELEPHONE STATION WALL PLATES AND JACK INSERTS

- A. Provide multiple jack modular wall plates where shown on plans or required. The number next to symbol on plans indicates the quantity of data lines/jacks at that location, single outlets are not numbered. The back of each jack wiring device shall have color-coded insulation displacement contact (IDC) type connections. The front shall have eight-position modular jack (RJ-45) and utilize T568B pin/pair assignments. One jack shall be provided at the end of each cable run. Each data or telephone jack shall be terminated and mounted in a suitable faceplate for all wall, enclosure, millwork, floor box, modular furniture, etc. locations. All terminations shall be made per the manufacturers' instructions with Panduit part number CWST wire snipping and stripping tool, and EGJT termination tool, or equivalent.
- B. Data RJ-45 inserts to be Category 6 Panduit part number CJ688TGBU, Mini-Com TX6 Plus, blue color, Category 6 Mini-Com modular jacks.
- C. CCTV Camera RJ-45 inserts to be Category 6 Panduit part number CJ688TGGR, Mini-Com TX6 Plus, green color, Category 6 Mini-Com modular jacks.
- D. Wireless Access Point RJ-45 inserts to be Category 6A Panduit part number CJ6X88TGYL yellow color, Category 6A Mini-Com 10Gig modular jacks..
- E. Provide blanks for unused ports to be Panduit part number CMBXX-X, Mini-Com Blank Modules.
- F. Use a single gang faceplate with label window for all standard wall outlets, use NEMA duplex or Decora style frames as required for floor boxes, surface raceway, etc.
 - 1. Single gang faceplate with label window for up to two Mini-Com Modules Panduit part number CFPE2XXY.
 - 2. Single gang faceplate with label window for up to four Mini-Com Modules Panduit part number CFPE4XXY.
 - 3. NEMA duplex style faceplate frame for up to two Mini-Com Modules Panduit part number CF1062XXY.
 - 4. NEMA duplex style faceplate frame for up to four Mini-Com Modules Panduit part number CF1064XXY.
 - 5. Decora style faceplate frame for up to two Mini-Com Modules Panduit part number CFG2XX.
 - 6. Decora style faceplate frame for up to four Mini-Com Modules Panduit part number CFG4XX.
 - 7. Modular furniture faceplates for up to four Mini-Com Modules Panduit part number UICFFP4XX.

2.11 WALL TELEPHONE STATION JACKS

- A. Provide a Category 6 non-keyed RJ-45 jack and stainless steel wall plate with telephone wall set mounting studs, and Category 6 cable to nearest MDF/IDF patch panel. The back of the device shall have color-coded insulation displacement contact (IDC) type connections. Stainless steel telephone plate with lead frame Category 6 Keystone Module Panduit part number KWP6PY.

2.12 EMERGENCY SERVICE/VOICE LINES

- A. Provide connectivity for emergency service/voice lines from the MDF, one line to each elevator phone and 911 emergency telephone/gateway. Provide two Category 6 lines to each alarm system digital communicator (DC).

2.13 CEILING MOUNT PROJECTOR LOCATIONS

- A. Provide a Category 6 non-keyed RJ-45 jack, mounted in an accessible location above the finished ceiling near the projector, and Category 6 cable to nearest MDF/IDF patch panel.

2.14 INTERIOR CAMERA LOCATIONS AND WIRELESS ACCESS POINT JACKS

- A. Provide a surface mount housing Panduit part number CBXQ2XX "biscuit block" for one or two Mini-Com Modules (two for wireless access points, one Category 6 and one Category 6A) with Category 6/Category 6A non-keyed RJ-45 data jack, and Category 6/Category 6A cable to nearest MDF/IDF patch panel.
- B. For drop ceiling mounting locations, surface mount housing to be mounted to structure or equivalent concealed above the finished ceiling.
- C. For open structure mounting locations, provide a Wiremold/Legrand model WAPBRKT overhead device bracket with removable cover. The bracket shall be constructed of galvanized steel with a large capacity device compartment: 12 3/4" long x 9 1/2" wide x 3 1/8" deep. The bracket shall be securely attached to the overhead building structure by the included strap hardware or by an all thread rod.

2.15 EXTERIOR WALL CAMERA LOCATIONS

- A. Provide a data jack surface mounted inside the building on the wall in a concealed and accessible location at least at 12" above the finished ceiling. Surface mount housing shall be a Panduit part number CBXJ2IW-A "biscuit block" for two Mini-Com Modules with label window, blank module, Category 6 non-keyed RJ-45 data jack, and Category 6 cable to nearest MDF/IDF patch panel.
- B. Adjacent to jack provide a 3/4" rigid threaded conduit stub passing through the exterior wall with a temporary threaded pipe-cap exposed, making the stub ready to thread-in to the device weather proof backbox/enclosure.

2.16 EXTERIOR WALL WIRELESS ACCESS POINT JACK LOCATIONS

- A. Provide a data jack surface mounted inside the building on the wall in a concealed and accessible location at least at 12" above the finished ceiling. Surface mount housing shall be a Panduit part number CBXJ2IW-A "biscuit block" for two Mini-Com Modules with label window, dual Category 6A non-keyed RJ-45 data jack, and Category 6A cables to nearest MDF/IDF patch panel.
- B. At locations indicated on the project plans, adjacent to jack provide a 3/4" rigid threaded conduit stub passing through the exterior wall with a temporary threaded pipe-cap exposed, making the stub ready to thread-in to the device weather proof backbox/enclosure.

2.17 DATA UTP STATION (HORIZONTAL) CABLING, CATEGORY 6

- A. NEC type CMP cable, GenSPEED 6000 Category 6 UTP cable, General Cable part number 7131900 with a Blue Plenum jacket..

2.18 CCTV CAMERA UTP STATION (HORIZONTAL) CABLING, CATEGORY 6

- A. NEC type CMP cable, GenSPEED 6000 Category 6 UTP cable, General Cable part number 7131906 with a Green Plenum jacket.

2.19 WIRELESS ACCESS POINT UTP STATION (HORIZONTAL) CABLING, CATEGORY 6A

- A. NEC type CMP cable, GenSPEED 10 MTP Category 6A Thin-Profile UTP cable, General Cable part number 7132852 with a Yellow Plenum jacket.

2.20 MDF/IDF PATCH PANELS

- A. Provide the required quantity of flat 19" rack mount patch panels at each MDF/IDF for all data and telephone jacks indicated on plans.
- B. Patch Panels shall accept Category 6 (data and telephone) and Category 6A (wireless access points) non-shielded UTP Mini-Com Jack Modules and feature style RU labeling slots. Provide one color-coded Category 6 or Category 6A Mini-Com Jack Module for each cable run. One jack shall be used for each cable run to a wireless access point, data, or telephone jack.
- C. Permanently mark patch panels with EIA/TIA 606 compliant machine printed labels.
- D. Patch panels to be 48 port, flat, 2 RU high, Panduit part number CPPL48WBLV, provide each with one Panduit part number SRB19BLY strain relief bar.

2.21 WORKSTATION AND MDF/IDF PATCH CORDS

- A. The Contractor shall provide one (1) 8 inch distribution frame patch cord and one (1) 10-foot workstation/equipment connection patch cord per installed run as indicated on the project plans.
- B. Category 6 data and CCTV camera patch cords shall be Panduit TX6 PLUS UTP Category 6 compliant, 4-pair stranded cable with a modular 8-pin connector for RJ-45 ports factory installed on each end.
- C. Category 6A Wireless patch cords shall be Panduit TX6A 10Gig F/UTP Category 6A compliant, 4-pair stranded cable with a modular 8-pin connector for RJ-45 ports factory installed on each end.
- D. Blue (data) patch cords to be:
 - 1. Panduit part number UTPSP8INBUY Blue (8 inch) Category 6 or equivalent.
 - 2. Panduit part number UTPSP10BUY Blue (10 foot) Category 6 or equivalent.
- E. Green (CCTV Camera) patch cords to be:
 - 1. Panduit part number UTPSP8INGRY Green (8 inch) Category 6 or equivalent.
 - 2. Panduit part number UTPSP10GRY Green (10 foot) Category 6 or equivalent.
- F. Yellow (Wireless) patch cords to be:
 - 1. Panduit part number UTP6ASD8INYL Yellow (8 inch) Category 6A or equivalent.
 - 2. Panduit part number UTP6ASD10YL Yellow (10 foot) Category 6A or equivalent.

2.22 INDOOR/OUTDOOR SINGLE-MODE FIBER OPTIC DATA BACKBONE CABLE FROM MDF TO NEW BUILDING IDF (ARMORED)

- A. Exterior data backbone runs shall consist of twelve-fiber single-mode optic cable with loose tube fibers, 125µm buffer coating, interlocking aluminum armored construction, UV resistant cable sheathing and Dry water-blocking technology. Single-mode glass strands shall be 9/125µm OS2 optical fiber. Outer jackets to provide 2,000 N/cm crush resistance and 2,000 impacts w/1.6 N-cm impact resistance.

- B. Provide twelve (12) single-mode fibers per run with all fibers terminated with duplex LC style connectors and bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.
- C. Portions of fiber optic backbone cables run underground shall include and 18 gauge copper trace wire and shall be fully enclosed in continuous underground or overhead conduit for additional protection.
- D. Single-mode Plenum Rated Indoor/Outdoor Interlocking Armored Cable shall be General Part Number AP0121ANU-ILPA 12-fiber 9/125µm (OS2) distribution cable.
- E. At the MDF termination end for each run, install a Panduit part number ACG24K Interlock-Armor Cable Grounding Kit or equivalent connected to the telecommunications room ground bar.

2.23 INDOOR/OUTDOOR MULTI-MODE FIBER OPTIC DATA BACKBONE CABLE FROM MDF TO NEW BUILDING IDF (ARMORED)

- A. Indoor/Outdoor data backbone runs shall consists of 10Gig 50/125µm (OM4) interlocking aluminum armored indoor/outdoor multi-mode fiber cable with dry water-blocking technology, and a UV-resistant outer jacket. Multi-mode glass strands shall be 50/125/900 µm 10Gig OM4 laser optimized optical fiber. Outer jacket shall provide 110 N/cm 100 cycle crush resistance and 2 cycle at 44.1 N/cm impact resistance.
- B. Provide twelve (12) strand multi-mode fibers per run with all fibers terminated with duplex LC style connector bulkhead splice bushings at each end. Labeling shall note cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.
- C. Portions of fiber optic backbone cables run underground shall include and 18 gauge copper trace wire and shall be fully enclosed in continuous underground or overhead conduit for additional protection.
- D. Multi-mode Plenum Rated Indoor/Outdoor Interlocking Armored cable shall be General part number BL0121ANU-ILPA Opti-Core Fiber Optic Indoor/Outdoor Cable, 12 fiber, 10Gig 50/125µm (OM4).
- E. At the MDF termination end for each run, install a Panduit part number ACG24K Interlock-Armor Cable Grounding Kit or equivalent connected to the telecommunications room ground bar.

2.24 RACK MOUNT FIBER OPTIC TERMINATION CABINETS

- A. Provide in racks requiring fiber optic cable termination a rack mount cabinet with removable door and cover for easy access. Shall contain a fiber radius hoop, integral strain relief bars, and plastic grommets at each cable entrance and exit. Cabinet to be 18-gauge steel, dual compartment, with a dividing plate fitted with pre-drilled coupler plates for LC duplex style bulkhead connectors. Mount in the top of rack, above the patch panels. Size for the number of terminations required plus 25% spare fiber optic connector mounting holes. To be rack mount Panduit OPTICOM QuickNet, FRME4 in the MDF and FRME1U in the IDF locations.
- B. For MDF to IDF single mode fiber runs, provide Panduit LC OPTICOM part number FAP6WBUDLCZ LC, FAPs loaded with six LC duplex 9/125µm single mode fiber (OS2) fiber optic adapters (Blue) with zirconia ceramic split sleeves.

- C. For MDF to IDF multi-mode fiber runs, provide Panduit LC OPTICOM™ part number FAP6WAQDLC, 10Gig 50/125µm (OM4) multi-mode Fiber Adapter Panels (FAPs) loaded with six LC duplex multi-mode fiber optic adapters.
- D. Mount on the lower portion of each rack one AC outlet strip. Provide a Tripp Lite part number IBAR12-20ULTRA horizontal power strip.
- E. All termination cabinets shall bear a warning label similar to the following: CAUTION - Never look into the end of a fiber optic cable or connector when using laser light output. Permanent eye damage can result. When cabinet is open wear eye protection and avoid touching unterminated fiber optic cable ends. Fiber fragment splinters can be difficult to remove.
- F. Permanently mark terminations with EIA/TIA 606 compliant machine printed labels noting cable type, run designation, "Tx" for the transmit fiber connectors, and "Rx" for the receive fiber connectors.

2.25 FIBER OPTIC JUMPERS

- A. For the new single mode fiber backbone runs, provide two (2) duplex fiber optic patch cords in each closet. Fiber Optic jumpers shall be Panduit part number F92ELNLNSNM002, 2 meter lengths.
- B. For the new multi-mode fiber backbone runs, provide two (2) duplex fiber optic patch cords in each closet. Fiber Optic jumpers shall be Panduit part number FX2ERLNLNSNM002, 2 meter length.

2.26 19" ENCLOSED WALL MOUNTED RACK:

- A. Provide as indicated on plans one (1) TIA/EIA standard 19" rail enclosed wall mounted cabinet rack with swing out body section and 5" deep rear panel. Unit to be 24" in height (18 RU), 24" wide, and 30" overall deep, with a black powder coated finish. Rack shall be securely bolted to the wall. To be Chatsworth Product Inc. (CPI) Part Number 11996-724, lockable solid door CUBE-iT Plus cabinet with optional low decibel dual fan and filter kit included, or equivalent.
- B. Mount fiber termination cabinets in the top portion of the rack and then the patch panels. Reserve the lower 50% of rack space for mounting of network electronics by the Owner.

2.27 IDF EQUIPMENT BACKBOARDS

- A. Provide a 4' x 8' x 3/4" C/D, exterior grade, plywood panel(s) as required, anchored to wall as required at no less than six points per panel. Equipment backboards are to be attached to wall studs or internal bracing with 1/4" minimum toggle bolts with washers. Plywood shall be new. Paint with fire retardant paint meeting UL 723 requirements - two full coats - color to be white unless otherwise directed by Architect.

2.28 GROUNDING

- A. In the new intermediate (secondary) telecommunications room (IDF) provide a 1/4" x 4" x 10" to 12" long copper ground bar with insulated wall mounting brackets - Panduit part number GB4B0612TPI-1, Newton Instrument Company ordering number 0030580010, or approved equivalent.
- B. The telecommunications grounding backbone, #2 AWG insulated wire minimum, shall bond each telecommunications ground bar to the building ground system.

2.29 CABLE ROUTING AND INSTALLATION

- A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical code requirements.
- B. The performance of the provided cabling system will be required to support of the 10Gig network 10GBASE-T standard. The contractor shall avoid outdated industry practices that can create worst-case conditions regarding heat dissipation and alien crosstalk. This includes the practice in which a large number of cables are routed together in a smooth very tightly packed form and the bundles are tie wrapped at close intervals (usually referred to as a “combed and laced”). A 10GBASE-T solution requires:
 - 1. Cable management strap installation shall not exceed 3 times per meter (once every foot). Plastic Tie wraps shall never be used. Cable management straps must not distort the cable jackets.
 - 2. Cable tray vertical depths no more than 6 inches, with hardware providing sweeping edges and well controlled entry points.
 - 3. Limit UTP cable bundles to 48 cables.
 - 4. Equipment cords may be bundled by combing to eliminate crossovers and may be tie wrapped, although separate minimum lengths may be required. Bundling is typical for long equipment cords. Cross-connect cords and work area cords shall not be combed and bundled, these cord applications shall be randomly placed or routed separately.
- C. For initial installation, the maximum fill capacity for pathways (i.e. conduit, raceways, trays, baskets) shall be 40 percent.
- D. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.
- E. All wiring shall test free from opens, grounds, or shorts. All communications cable shall be supported from the building structure and bundled. Do not attach any supports to joist bridging or other lightweight members.
- F. The support system shall provide a protective pathway to eliminate stress that could damage the cabling. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.
- G. Communications cable must not be fastened to electrical conduits, mechanical ductwork/piping, sprinkler pipes, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel with line voltage electrical conductors. Communication cables shall not be run loose on ceiling grid or ceiling tiles.
- H. Support shall be provided by mounting appropriate fasteners that may be loaded with multiple cables. Provided that the weight load is carried by the support rod or wire, the support assembly may attach to the ceiling grid for lateral stabilization. The required support wires for the ceiling grid or light fixtures shall not be utilized. Any fastener attached to the ceiling grid shall not interfere with inserting or removing ceiling tiles. The cable pathway of supports must be positioned at least 12 inches above the ceiling grid.
- I. Communication cables shall be run in conduits, where stubs are provided, from wall or floor jacks to accessible areas above finished ceilings. Conduit shall be required only within walls and concealed spaces to provide access.
- J. Provide bushings to protect the cable from damage for conduit ends, box openings, and passage through metal studs.

- K. Communication cables shall be run in bundles above accessible ceilings and supported from building structure. Limit UTP cable bundles to 48 cables. Cabling shall be loosely bundled with cable Velcro hook ties randomly spaced at 30 to 48 inches on center, cable ties shall not be tight enough to deform cabling and shall not be used to support the cabling.
- L. Both ends of all cables, all terminal blocks, patch panels, and network system components shall be labeled utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels according to EIA/TIA 606 standards. Utilize a Panduit PanTher™ LS8E Printer or equivalent.
- M. Each cable run shall include a three-foot service loop with Velcro hook ties located in the ceiling above the rack. This is to allow for future re-termination or repair.
- N. All cabling shall be placed with regard to the environment, EMI/RFI interference, and its effect on communication signal transmission.
- O. Non-conductive fiber optic cable is immune from EMI/RFI interference. Give priority when selecting a route to minimize exposure to possible cable damage from maintenance or service of all systems in the attic space.
- P. Do not route any data cable within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor or transformer.
- Q. Communication cable will not be installed in the same conduit, raceway, tray, duct, or track with line voltage electrical cable without a metallic barrier meeting NEC requirements.
- R. Maximum cable pulling tension should not exceed 25 pounds force (110 N) or the manufactures recommendation, whichever is less.
- S. Any pulling compounds utilized must be thin film lubricants approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.
- T. No terminations or splices shall be installed in or above ceilings.
- U. Cable bends shall not be tighter that the manufacturers' suggested bend radius.
- V. Mount all equipment firmly in place. Route cable in a professional, neat and orderly installation.
- W. Provide for adequate ventilation to all equipment racks and take precautions to prevent electromagnetic or electrostatic hum.

2.30 UTP CABLE TERMINATION PRACTICES

- A. Insulation Displacement Contact (IDC) connectors shall be used and installed per the manufactures' recommendations.
- B. Strip back only as much cable jacket as required to terminate.
- C. Preserve wire-pair twists as closely as possible to point of termination (0.5" maximum) to keep signal impairment to a minimum.
- D. Avoid twisting cable jacket during installation.
- E. Take care to insure all data UTP wiring devices are installed as T568B wiring, T568A devices use a different pair assignment and should not be mixed.

- F. Panduit part number CWST wire snipping and stripping tool, and EGJT termination tool, or equivalent.
- G. Score for removal approximately 3" of cable jacket using a manufacturers recommend stripping tool set to cut through the outer jacket. Note that the suppression barrier tape is not to be grounded.
- H. Gently bend the cable's jacket back and forth to free it and remove that portion of the outer jacket.
- I. Snip the end of the suppression barrier tape, split it, fold it down and trim it even with the outer jacket.
- J. Bend back the four pairs and cut the center spline. It is not necessary to provide a completely flush cut as attempting to do so may damage the conductors.
- K. Trim the pairs to length per the per the manufactures' recommendations.
- L. Without untwisting or pre-arranging the pairs, feed each pair into the correct opening in the jack stuffer housing.
- M. Push the cable fully into the jack stuffer housing.
- N. Trim the pair ends of with the manufactures' recommended trimming tool.
- O. Loosen the pair twists only enough to seat the conductors into the color-coded IDC slots.
- P. Snip off the conductor ends flush with the jack stuffer housing.
- Q. Insert the stuffer housing into the jack outer housing and clamp them tight using the manufactures' recommended termination tool.
- R. Once the other end of the cable is terminated, test the cable from end to end with a cable tester. Be sure that all eight conductors have proper connection.
- S. Data and Telephone Cable UTP T568B, Identical to AT&T 258A and WECO, Pin/Pair Assignments (All RJ-45 modular jacks):

<u>Pin:</u>	<u>Line/Pair:</u>	<u>Color:</u>
1	Tx 2	White/Orange Band
2	Rx 2	Orange
3	Tx 3	White/Green Band
4	Rx 1	Blue
5	Tx 1	White/Blue Band
6	Rx 3	Green
7	Tx 4	White/Brown Band
8	Rx 4	Brown

2.31 OPTICAL FIBER CABLE INSTALLATION AND TERMINATION PRACTICES

- A. The following fiber optic connector installation methods are acceptable; fusion splice connection of factory made pigtail connectors, epoxy/polish style connectors, or non-epoxy compression cam gel style connectors. In each case, the connector manufactures' instructions shall be followed and the recommended tools and supplies, including break out kits when required, shall be used for termination and testing. All Fiber strands to be terminated including future use pairs.

- B. During optical fiber connector termination, visually inspect all terminations with a 200-power microscope (minimum). Follow all of the connector manufacturers' recommendations. Unacceptable flaws in the terminations will include, but not be limited to, scratches, full or partial cracks, bubbles, pits, or residual dirt, dust, oil, moisture, grinding or sanding debris in the connector. The acceptable final inspection shall show a connector tip that is properly aligned and free of imperfections in 100% of the core and 80% of the cladding. Any connectors that fail testing shall be inspected and re-tested after rework.
- C. During installation of optical fiber cable, do not allow pulling tension to exceed cable manufacturers' specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.
- D. Clean all optical fiber connector tips prior to inserting them into mating receptacles or bulkheads and re-install dust covers. Clean the tester launch cord prior to each insertion, as well.

2.32 CABLE SUPPORT

- A. Conduit, duct, or track shall be used for communication cable in exposed areas.
- B. Cable fill shall not exceed the manufacturers' instructions for each type of support.
- C. All conduit, ducts, track, and raceways shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices.
- D. Solid, ladder, or mesh cable tray/duct shall be required for narrow depth cable routes that would allow sags to rest upon the ceiling, electrical conduits, HVAC equipment, ducts, or lighting fixtures.
- E. Vertical cable runs exceeding 12" in equipment closets shall require ladder or mesh type cable support tray. Attachment shall utilize appropriate mounting hardware and accessories for vertical placement and allow a minimum of 2" clearance between the wall and runway. Cable attachment shall be made by Velcro hook ties in a basket type configuration.
- F. All vertical supports shall be attached to the building support structure or concrete ceiling with anchors load rated for 100-lbs. minimum. Down rods shall be a minimum of 1/4" diameter. Steel uni-strut cross supports shall be 2" minimum.
- G. Cable runway or tray shall be grounded to an appropriate building ground at each end and bonded at each joint.
- H. Rubber or plastic boots shall be installed at the ends of horizontal support rails to prevent cable damage or injuries to personnel.

2.33 BUSHINGS

- A. Provide a plastic snap in bushing at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves prior to cable installation to protect the cabling from damage:
 - 1. Box openings - Thomas & Betts Knockout Bushing Series 3210, or equivalent.
 - 2. Metal stud passage - Thomas & Betts Twist It Bushing Catalog Number SB1216-SC, or equivalent.
 - 3. Conduit ends - Thomas & Betts Anti-Short Bushing Series 390 or Tite-Bite Combination couplings Series 442, or equivalent.

2.34 J-HOOKS

- A. Attachments for cabling support shall be spaced at approximately 48 to 60 inches on center. Cable bundles shall not be allowed to sag down more than 12-inches mid-span between attachments.
- B. All attachments shall be approved for Category 6A cabling. Attachments shall be Caddy part numbers as follow, or equivalent, sized as follows:
 - 1. CAT16HP, 1" diameter Capacity 7 to 10 Category 6A cables.
 - 2. CAT21HP, 1.31" diameter Capacity 12 to 24 Category 6A cables.
 - 3. CAT32HP, 2" diameter Capacity 25 to 35 Category 6A cables.
 - 4. CAT48HP, 3" diameter Capacity 48 Category 6A cables.
 - 5. Split bundles greater than 48 cables (maximum allowed bundle size) or provide cable tray.
- C. Do not mix different signal strength cables on the same J-Hook (i.e. fire alarm with data and telephone cable). Multiple J-Hooks can be placed on the same attachment point, up to the rated weight load of the attachment device.

2.35 CABLE TIE WRAPS

- A. Hook and loop cable management straps shall be furnished and installed to manage wire bundles as required. Straps shall be installed loosely to not deform or support cable.
- B. Velcro hook cable ties shall be furnished and installed to attach wire bundles to supports and for appropriate wire management as required. Provide and install Panduit TAK-TY Plenum rated cable ties or equivalent.
- C. Saf-T-Grip® Open Loop Series or equivalent for free vertical hanging cable. Chastworth Products Inc. part number 02006-201 Open Loop, 6" long (for 2" diameter bundles)
- D. Saf-T-Grip® End Grommet Buckle Series or equivalent to mount cable along walls, backboards, and horizontal cable runs. Chastworth Products Inc. part number 05006-201 End Grommet & Buckle, 6" long (for 2" diameter bundles)
- E. Hard plastic or metal tie wraps will not be allowed on any data cable (Category rated twisted pair).

2.36 MEASURING PULLING TAPE (MULE TAPE)

- A. All future use innerduct and conduit cable pathways shall include a Measuring Pulling Tape (Mule Tape) made of woven Polyester, Aramid, Kevlar, or an equivalent fiber blend. Measuring Pulling Tape shall have a minimum tensile strength of 1250 lbf. or as required and shall be pre-lubricated for prevention of burn though and marked for measuring in feet. Measuring Pulling Tape installed in underground pathways shall incorporate a 22-gauge minimum solid corrosion resistant copper conductor for use in radio signal locating procedures.

2.37 LADDER TYPE CABLE TRAY

- A. Ladder type cable tray shall be routed over all floor-mounted racks from wall to wall, provide all necessary hardware to attach the ladder rack to the top of the floor rack and to the walls. All field cuts shall be filed smooth, dressed square, and painted to match. Utilize tray splicing, support, and coupling hardware supplied by and installed as recommended by the manufacturer. Cable tray and rack shall be securely supported and grounded. See 19" Open Equipment Racks section.

2.38 MESH CABLE TRAY

- A. Mesh constructed cable tray systems shall be utilized for high capacity and special pathway support requirements. Mesh cable tray shall be constructed from steel wires. All edges and welds are to be smooth and free of burs or sharp edges. Mesh tray assemblies shall be zinc plated after fabrication. All field cuts shall be filed smooth, dressed square, and touched up with zinc bearing paint to prevent rust formation. Mesh openings shall not exceed 2" x 4". Provide size 12" wide x 4" deep as required for a 50% maximum initial fill rate. Provide straight sections, vertical offsets, tees, crosses, radiused bends, reducers, and radiused dropouts as required. Utilize tray splicing, support, and coupling hardware supplied by and installed as recommended by the manufacturer. Support from building structure. Provide WBT WBT4X12 S BL series as required.

2.39 FIRE OR DRAFT STOPPING, PENETRATIONS, AND CORING

- A. UL Listed fire stopping methods that match the fire rating of the wall or floor being penetrated are to be used at all fire barrier penetrations. Seal the interior of the conduit sleeve around the cables and around the outside of the sleeve on each side of the penetration with fire-stop caulk or putty, install according to the manufacturers' instructions.
- B. All penetrations through fire rated walls or floors shall feature a suitable length of metal conduit. Hole diameter shall not exceed 1/2" larger than the conduit or sleeve to be installed. The hole shall be neatly cut, not oversize or irregular. Do not share wall/floor penetrations with ductwork, piping, line voltage electrical conduits, etc.
- C. All gypsum board or plaster penetrations shall tool cut using an appropriate hole saw / mandrel or manufactured assembly.
- D. Draft/Noise Stopping - This Contractor prepares for and applies draft/noise stopping to all non-rated wall penetrations. Draft/Noise stopping shall minimize the movement of air and sound from enclosed areas to other parts of the building. This shall include but not limited to:
 - 1. Neatly cutting all non-rated wall/floor penetrations with a 1" maximum clearance. All gypsum board or plaster penetrations shall tool cut using an appropriate hole saw / mandrel or manufactured assembly. The hole shall be neatly cut, not oversize or irregular. Do not share wall/floor penetrations with two types of ductwork, piping, line voltage electrical conduits, communications cabling, etc.
 - 2. Provide and install non-combustible mineral wool, fiberglass, cellulose insulation, caulk, and sealant as required. Seal the interior of conduit sleeves around the cables and around the outside of the sleeve on each side of the penetration with caulk or putty, install according to the manufacturers' instructions.
- E. The Contractor shall make every effort to coordinate with the building Architect, Engineer, Builder and Electrical Contractor to have sleeves placed in new construction so that later coring or drilling of building structural members will not be required. The Contractor must consult with the building Architect, Engineer, and Builder prior to drilling, coring, or sawing of any wall, floor, etc. All penetrations shall be made at approved, appropriate, locations.
- F. Upon approval, the Contractor shall be required to supply all labor, equipment, tools, and materials to create any additional penetrations, and shall provide the sleeve, temporary and final fire stopping. Special care shall be taken not to stress, overheat, or penetrate any building support member. Coring shall be made with equipment appropriate for the dry penetration of concrete and block materials. Under no circumstances shall penetrations be made utilizing a chisel or percussion type equipment. Concrete, block, or plaster cores shall be made by dry saw/core methods only.

PART 3 - EXECUTION

3.1 WARRANTY, SERVICE, TESTING, CERTIFICATION

- A. The Contractor must provide an extended warranty that is inclusive of the Manufacturer's warranty to the Owner covering all network cable and connectivity hardware products comprising this installation site. The Contractor and Manufacturer shall jointly provide the Owner an extended warranty of the installed system against defects in material or workmanship for a period of no less than twenty years (period as is customary for the Manufacturer) from the date of substantial completion. Any equipment or cabling shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner.

3.2 UTP CABLE AND LINK TESTING

- A. The System Contractor shall make a thorough inspection of the complete installation to ensure the following:
 - 1. Complete and functional system.
 - 2. Installed in accordance with manufacturers' instructions.
 - 3. All cabling shall test free from all grounds, opens, and shorts.
 - 4. A representative of the Owner may be present for all final testing. Coordinate final testing with Owner, schedule as near as possible to acceptance date.
- B. Acceptance Testing: Test each conductor of every cable on the reel to verify length and continuity. Cables that have been damaged in transit must be replaced. Installed cable that proves to be defective will be replaced at the contractor's expense.
- C. Final Testing: All UTP cabling will be certified to meet and or exceed the specifications as set forth for Permanent Link Testing of all 10GBASE-T electrical parameters including alien crosstalk performance. Testing shall meet TIA/EIA compliant standards appropriate for each device type including:
 - 1. Category 3 and 5e per TIA/EIA-568B / TIA Category 5 (1000BASE-T) per TIA TSB-95 / TIA
 - 2. Category 6-CLASS E/D Permanent Link Testing per TIA TSB-67 / TIA
 - 3. Category 6A/Class EA per TIA/EIA-568B.2-10 / TIA TSB-155 / ISO/IEC 11801 Class C, D, and E / ISO/IEC 11801 Class EA, F / EN 50173 Class C, D, E / EN 50173 Class F / ANSI TP-PMD; Networking Standards: IEEE 802.3 / I.
- D. Test alien crosstalk (near-end and far-end loss) for a cabling system using a network analyzer with 100-Ω pair terminations as follows:
 - 1. Frequency range from 1 to 500 MHz (250 MHz for Category 6);
 - 2. The test device consists of two jacks; one jack is connected to a main test unit and the other to a remote test unit; the main test unit and the remote test unit are connected with a field tester communication channel (patch cord or link);
 - 3. Six-around-one cable-bundle configuration throughout the tested length;
 - 4. Cable ties placed 12 inches apart for the entire length of the bundle, except the last 3.2 feet from each end; no cable-tie-induced deformation of the bundle;
 - 5. Modeling four-connector channel configurations using the worst-case maximum and minimum configurations to determine the worst-case for different parameters;
 - 6. Long channels with 90 meters of permanent link, 5 meters between the consolidation point and the telecommunications outlet, 10 meters of patch cords used to connect active equipment and cross-connect panels;
 - 7. Measurement of alien crosstalk (near-end and far-end loss) between all pairs of the middle disturbed cable and each pair of all adjacent cables;
 - 8. Measurement of power sum of all 24 adjacent pair cables.

- E. The cable tester shall a UL Level III tester or equivalent with the latest version of firmware and shall produce a printed report, noting label information, for each cable run. These reports are to be included in the close-out documentation. Testing shall be conducted with a Fluke DTX 1800, or equivalent, copper/fiber/OTDR cable analyzer with DTX 10 Gig kit including alien crosstalk communication modules, permanent link adapters, high-performance channel adapters, termination plugs, 8-pin modular couplers and analysis software. Certifications shall include the following parameters from up to 1 to 500 MHz for each pair of each cable installed:
1. Characteristic Impedance $100\ \Omega \pm 15\%$
 2. Wire map (pin to pin and ground connectivity)
 3. Cable Length Permanent Link, station (horizontal) cable from patch panel to jack, should not exceed 295 feet (Channel length not to exceed 328 feet).
 4. Attenuation
 5. Pair to pair NEXT
 6. PSNEXT
 7. FEXT (Far end crosstalk)
 8. Pair to pair ELFEXT (Equal level far end crosstalk)
 9. PSELFEXT
 10. Return Loss
 11. PSACR
 12. Propagation Delay
 13. Delay Skew
 14. Alien Crosstalk

3.3 OPTICAL FIBER TESTING

- A. Acceptance Testing: Test each strand of every optical fiber cable on the reel with an OTDR, to verify length and continuity. Fiber cables that have been damaged in transit must be replaced. Installed fiber cable that proves to be defective will be replaced at the contractor's expense.
- B. Final Testing: After termination each individual fiber of each cable segment shall be tested using an OTDR, both to determine the installed length and continuity. All individual fibers of each cable segment will be tested using a power meter to determine the actual loss. These readings will be taken at the 850 nm and 1300 nm windows for Multimode and 1310 nm and 1550 nm windows for single-mode. Testing will be in both directions. The final readings shall be listed in the certification report. These readings must not be higher than the "Optimal Attenuation Loss." The OAL will be calculated using the manufacturers' factory certified test results, (dB/Km) converted to the actual installed lengths plus the manufacturers' best published attenuation losses for the connector and/or splice installed on this project. (0.20 for Connectors and 0.10 for splices.) The OAL shall be used for comparison with the end to end power loss test results prior to acceptance by the construction manager.
- C. Fiber optic cable shall be subjected to bi-directional testing meeting EIA/TIA 568B, Section B.3, testing recommendations. The cable tester shall produce a printed report, noting label information, for each cable run. These reports are to be included in the close-out documentation.

3.4 DRAWINGS, MANUALS, AND TRAINING

- A. As-built drawings and operating and maintenance manuals may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.

- B. Upon completion of the installation, and prior to final inspection, the Contractor shall furnish as-built drawings.
- C. In addition, the contractor shall furnish complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Place final cable certification test results in manuals.
- D. All cable paths and wiring methodology shall be documented. All cables shall have both ends labeled and included in the as-built documentation. Provide an MS Excel worksheet compatible format spreadsheet file cross referencing all cable run numbers, architectural room number, and owners room number for the origin and destination of each cable run.
- E. A formal on-site training session shall be provided by the Contractor to the Owners Representative / Maintenance personnel and shall include instruction on the documentation, location, inspection, maintenance, testing, and operation of all system components. Provide a minimum of two (2) hours of documented general instruction.

END OF SECTION

SECTION 28 05 00

GENERAL ELECTRONIC SAFETY AND SECURITY SYSTEM REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Electronic Safety and Security Systems complete including modification of existing systems to be revised and expanded, cabling, special backboxes, hardware and all other required devices and equipment.
- C. Installation of system equipment per specifications.
- D. Supply in a timely manner to the electrical contractor special backboxes for installation as required.
- E. Coordinate wireway, raceway, power, and outlet requirements with the builder and the electrical contractor.
- F. Electronic Safety and Security Systems Contractors shall provide and install prior to cable installation plastic snap in bushings at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves to protect the cabling from damage.
- G. Furnishing of all required materials, equipment, tools, scaffolding, labor, and transportation necessary for the complete installation of the Electronic Safety and Security systems as shown on the drawings and as specified herein.
- H. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.
- I. It is the intent of these specifications to provide complete installations although every item necessary may not be specifically mentioned or shown.

1.2 WORK TO BE INCLUDED BY THE ELECTRICAL CONTRACTOR IN BASE CONTRACT PROPOSAL

- A. Provide utility services conduit as outlined on drawings as required.
- B. All required conduit for accessibility to attic space.
- C. Furnishing and installation of all required standard back boxes and conduit.
- D. Installation of special back boxes supplied by Division 28 contractor(s).
- E. Furnishing and installation of all floor boxes, surface raceways, and other wireways which are detailed or specified under Division 26.
- F. Provide equipment-mounting boards as outlined on drawings.
- G. Provide equipment grounding system, conductors, and bus bars and as outlined in Division 26.

- H. Provide 120-volt power and hook-up to equipment provided in Division 28.
- I. Coordination of requirements of Division 28 with the Builder.

1.3 WORK NOT INCLUDED

- A. Contractors shall make no agreement that obligates the Owner to pay any company providing communications, monitoring, or other services. Contractors shall not make selection, purchase, or installation of interconnect instruments/equipment to be used on this project.

1.4 RELATED SECTIONS

- A. The conditions of the Division 0, Division 1, Division 26 requirements, and the contract requirements that include the General Conditions and the Supplementary Conditions apply to work of this division.
- B. Section 26 05 34 - Provisions For Communication, Security & Safety Systems.

1.5 OWNER FURNISHED CONTRACTOR INSTALLED (OFCI) EQUIPMENT

- A. The contractor shall verify that new and existing products and site conditions are satisfactory for installation or relocation of OFCI equipment. If unsatisfactory conditions exist or other discrepancies are identified, the contractor shall immediately document the conditions and notify the owner in writing.
- B. The contractor shall coordinate all required equipment schedule quantities and any dimensions or variations required to adapt to field conditions with the owner at the earliest possible date.
- C. The contractor shall verify compatibility, installation rough-in, mounting, and utility requirements for the scheduled OFCI equipment.
- D. The owner shall coordinate delivery dates with the builder to meet the construction schedule.
- E. The installation of items as identified in the plans and specifications as OFCI equipment shall conform to the provisions of the Contract Documents and shall be coordinated with the builder.
- F. Installation shall be performed by competent and trained workers in accordance with all applicable codes and governing regulations.
- G. Installation, testing, and startup shall comply with the manufacturer's instructions.
- H. The contractor shall provide all miscellaneous hardware, structural support, cabling, fittings, etc. that is not included by the manufacture, but required for installation.
- I. The contractor shall clean and adjust all relocated and new OFCI products as necessary.
- J. All crating, packing materials, and debris and shall be properly disposed of off-site.
- K. Installation shall be subject to inspection by the architect, engineer, owner, and builder. The installer shall not proceed until any unsatisfactory conditions are corrected. Any damage caused by improper handling or installation procedures shall be corrected at no cost to the owner.

- L. For drop shipped equipment, the builder shall be the consignee and shall have a representative on site for coordination of delivery, to receive shipments, and to inspect each shipment for obvious signs of damage or shortages. The builder shall be responsible for all shipping damage claims, including hidden damage, refusal of shipment, and Return Authorization procedures. The builder shall provide secure storage, handling, and protection from the elements, prior to the contractors' acceptance for installation.
- M. For equipment stored at an owner's facility, the contractor shall load the equipment and provide transportation to the work site. Prior to loading, the contractor shall inspect the equipment for obvious signs of damage and document all quantities, noting shortages from the project requirements, indicating acceptance of the merchandise as is and in good order.
- N. The contractor shall conduct and properly document testing of all installed equipment to verify proper operation. When appropriate, on site operation and maintenance instruction shall be provided to the owner's personnel. This instruction shall include demonstration of proper use, maintenance, and cleaning procedures.
- O. The nature of the equipment procurement shall determine responsibility for resolving any claims with the manufacturer or supplier relating to defects in material or workmanship and warranty claims. The party that purchased the equipment shall resolve these issues.

1.6 CODES, STANDARDS, AND THEIR ABBREVIATIONS

- A. General:
 - 1. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
 - 2. In addition to the requirements outlined in other sections of the specifications the following standards are imposed as applicable to the work in each instance:
 - a. OSHA Safety and Health Regulations for Construction.
 - b. NFPA No. 70 National Electrical Code.
 - c. NESC National Electrical Safety Code, ANSI Standard C2.
 - d. NEIS National Electrical Installation Standards.
 - e. Local Codes and Ordinances.
- B. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's responsibility to perform the work in accordance with the local code prevailing and local interpretations thereof. Any such additional work shall be performed at no additional cost to the Owner.
- C. Materials and components shall be UL listed and labeled by Underwriters Laboratories, Inc. for the intended use under the latest appropriate testing standard.
- D. The Contractor shall obtain all permits required to commence work. Upon completion of the Work, the Contractor shall obtain and deliver to the Owner's Representative a Certificate of Inspection and Approval from the State Board of Fire Underwriters, the City of Midlothian, Texas, and other authorities having jurisdiction. The Contractor shall pay required permit fees.

1.7 LIST OF ASSOCIATIONS AND STANDARDS:

ADA:	Americans with Disabilities Act.
ANSI:	American National Standards Institute, 1430 Broadway; New York, NY 10018.
ASTM:	American Society for Testing and Materials, 1916 Race Street; Philadelphia, PA 19103.
BICSI:	(RCDD5 Standards), 8610 Hidden River Parkway, Tampa, FL 33637

CBM:	Certified Ballast Manufacturers Association, 2116 Keith Building; Cleveland, Ohio 44115.
IEEE:	Institute of Electrical and Electronics Engineers, 345 East 47th Street; New York, NY 10017.
ICEA:	Insulated Cable Engineers Association, P.O. Box P, South Yarmouth, MA 02664.
NEC:	National Electrical Code; NFPA No. 70.
NECA:	National Electrical Contractors Association, Inc., 7315 Wisconsin Ave.; Washington, DC 20014.
NEMA:	National Electrical Manufacturers Association, 155 East 44th Street; New York, NY 10017.
NESC:	National Electrical Safety Code, ANSI Standard C2.
NFPA:	National Fire Protection Association, 60 Batterymarch Street; Boston, MA 02110.
OSHA:	Occupational Safety and Health Administration, US Department of Labor; Washington, DC 20402.
TAS:	Texas Accessibility Standards (TAS) Article 9102.
UL:	Underwriters Laboratories, Inc., 333 Pfingsten Road; Northbrook, IL 60062.

- A. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.
- B. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.
- C. The date of the code or standard is that in effect on the date of issue stated on the contract documents, except when a particular publication date is specified.
- D. The Contractor shall comply with all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting any deficiencies due to non-compliance.
- E. Where local codes and ordinances are not in writing or on record but local precedence have been set, the Owner shall pay for any additional resulting cost.

1.8 DEFINITIONS

- A. Approval: It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work. Approval by the Architect of any changes, submitted by the Contractor, will be considered as general only to aid the Contractor in expediting his work.
- B. The Builder: The primary contractor engaged to oversee the construction project. They may be technically described as a Construction Manager, General Contractor, Managing Construction Contractor, et cetera.
- C. The Contractor: The Contractor engaged to execute the work included a particular section only, although he may be technically described as a Subcontractor to the Builder. If the Contractor, engaged to execute said work, employs Sub-Contractors to perform various portions of the work included under a particular Section, they shall be held responsible for the execution of this work, in full conformity with Contract Document requirements. The Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various sections and phases of work may be properly coordinated without unnecessary delays or damage.
- D. The Electrical Contractor: The Electrical Contractor shall be engaged to execute the work included Division 26 only.

- E. PDF file or .pdf: The filename extension associated with “Portable Document Format” files, which are multi-platform computer files in the ISO 32000-1:2008 open standard format developed and licensed by Adobe Systems. These files are a digital electronic representation of text, documents, images, and technical drawings in a font and color-accurate fixed-layout format that is platform and display resolution independent. PDF files can be electronically transmitted, viewed, or printed with various free PDF reader application programs, and may allow markups/comments with various PDF editing application programs.
- F. Provide: Defined as requiring both the furnishing and installation of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.9 SCHEDULE OF VALUES, APPLICATION FOR PAYMENT

- A. The Contractor shall in accordance with the General Provisions of the Contract, including General and Supplementary Conditions, and Division 1, complete a Schedule of Values and Applications for Payment. When a portion of this work separately funded, including donations or E-Rate, the contractor shall accommodate this in the Schedule of Values and Applications for Payment. For E-Rate eligible portions of this work, the contractor will be required to participate in the E-Rate program, comply with all E-Rate regulations, and provide billing as needed. The contractor shall coordinate with the Owner to file Form 471 or latter edition and/or other forms as may be required.

1.10 WARRANTY

- A. The Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.
- B. Neither the final payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.
- C. He shall remedy any defects due thereto, and pay for any damage to other work resulting there from, which shall appear within a period of one year from date of substantial completion.
- D. The Owner shall give notice of observed defects with reasonable promptness.
- E. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.11 SITE VISIT

- A. Before submitting a proposal, each proposed contractor shall examine all plans and specifications relating to the work, shall visit the site of the project, and become fully informed of the extent and character of the work required, including all required utilities.
- B. No consideration will be granted for any alleged misunderstanding of the materials to be furnished or the amount of work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying plans or required by nature of the site of which may be fairly implied as essential to the execution and completion of any and all parts of the work.

1.12 SUBMITTALS

- A. Submittal procedures shall be per Division 1 - General Requirements.
- B. Provide a complete submittal for each section as specified.

- C. Submit complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- D. A submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- E. Each Product data submittal shall include:
 - 1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
 - 2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 - 3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
 - 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 - 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 - 6. When the contract requires extended product warranties, submit a sample of warranty language.
 - 7. Any resubmittal shall include a complete revised equipment list and any product data that is revised.
- F. Submit shop or coordination drawings, when specified or the required for the scope of work, which include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.
- G. The Engineer's review of submittals is only for confirmation of adherence to design of project and does not relieve the Contractor of final responsibility for furnishing all materials required for a complete working system and in complying with the Contract Documents in all respects.

1.13 PROJECT RECORD DOCUMENTS

- A. 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.
- B. Upon submitting his request for final payment, he shall turn over to the Architect/Engineer, for subsequent transmittal to the Owner revised plans showing "as installed" work.
- C. In addition to the above, the Contractor shall accumulate during the jobs progress the following data in PDF file format (preferred) or paper copies to be turned over to the Architect/Engineer for checking and subsequent delivery to the Owner:
 - 1. All warranties, guarantees, and manufacturer's directions on equipment and material covered by the Contract.
 - 2. PDF file or paper copies of all Shop Drawing prints and CAD or BIM engineering drawing program files.

3. Any software programs, data/programming files, passwords, special interface cables, or keys that may be needed to maintain or access equipment.
4. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
5. Any and all other data and/or plans 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. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
 - a. Builder and all Contractors.
 - b. Major Equipment Suppliers
 - c. Submit communication systems warranties.

1.14 TRAINING

- A. Upon completion of the work and at a time designated by the Architect, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all Electronic Safety and Security systems equipment and systems.
- B. See other sections for time requirements.

1.15 PLANS AND SPECIFICATIONS

- A. The intent of the project drawings is to establish the types of systems and functions, but not to set forth each item essential to the functioning of the system.
- B. Electrical drawings are generally diagrammatic and show approximate location and extent of work.
- C. Install the work complete including minor details necessary to perform the function indicated. Provide Electronic Safety and Security systems (including all hook-ups) complete in every respect and ready to operate.
- D. If clarification is needed, consult the Architect/Engineer.
- E. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies occur between drawings, specifications, and actual field conditions, immediately notify the Architect/Engineer for his interpretation.
- F. The Architect/Engineer reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

1.16 PRODUCT SUBSTITUTIONS:

- A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose systems which differ in manufacturer, features, functions, or operating characteristics from those outlined in these specifications must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.

- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified and include relevant technical and cost data. This shall include a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.
- D. The Engineer will consider all such submittals and the Architect will issue an addendum listing items that the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.
- E. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of the alternate system shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically ensure the system will be an acceptable equivalent.
- F. The Contractors' proposal represents that the contract proposal price is based solely upon the materials, equipment, and labor described in the Contract Proposal Documents (including addenda, if any) and that he contemplates no substitutions or extras.
- G. The manufacturer of the proposed substitute unit shall provide samples for evaluation, when required, at no charge and non-returnable.
- H. Requests for substitution are understood to mean that the Contractor:
 - 1. Has personally investigated the proposed substitution and determined that it is equivalent or superior in all respects to that specified.
 - 2. Will provide the same guarantee for the substitution that he would for that specified.
 - 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.
 - 4. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances:
 - a. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
 - b. The specified product is unavailable through no fault of the Contractor.
 - c. The manufacturer refuses to warranty the specified products as required.
 - d. Subsequent information indicates that the specified product is unable to perform properly or to fit in the designated space.
 - e. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.
 - f. Revisions to the electrical system caused by substitutions shall be under the supervision of the Engineer, at a standard hourly rate charged by the Engineer. Charges from the Engineer, Architect, and Electrical Contractor shall be paid by the Contractor originating the changes.

1.17 FUTURE USE CABLING

- A. When cabling is installed for future use, it shall be identified with a tag of sufficient durability to withstand the environment involved.
- B. Locations and Existing Conditions:
 - 1. Location and condition of any existing equipment or services, when shown, have been obtained from substantially reliable sources, are shown as a general guide only, without guarantees as to accuracy.

2. The Contractor will examine the site, verify all requirements, service points, and availability of all services required to complete this project. No consideration will be granted for any alleged misunderstanding of the materials and labor to be provided as necessitated by nature of the site including those items that may be fairly implied as essential to the execution and completion of any and all parts of this project.

1.18 EXISTING ELECTRONIC SAFETY AND SECURITY SYSTEMS MODIFICATION AND EXPANSION FOR ADDITIONS AND RENOVATION

- A. As indicated by the plans and specifications the electronic safety and security contractor shall be responsible for modification of the existing electronic safety and security systems, including demolition of any devices and cabling previously abandoned. Demolition shall include:
 1. Disconnection and removal of all electronic safety and security devices not to remain in service in walls, floors, and ceilings.
 2. Identification and verification of abandoned wiring and equipment. All disconnected or abandoned devices that are visible shall be removed, i.e. non-functional fire pulls, bells, speakers, signals, et cetera. Remove abandoned wiring to the source of the supply everywhere possible, the accessible portions of all inaccessible abandoned cabling shall be removed.
 3. Removal of exposed abandoned conduit and supports including brackets, stems, hangers, and other accessories located on walls and above accessible finished ceilings. Cut abandoned conduit flush with walls, floors, etc., and patch surfaces.
 4. Provide a blank cover for abandoned device backboxes that are impractical to remove from masonry construction without unnecessary damage.
 5. Confirm with Owner/Architect regarding the handling and disposal/reuse of removed material, equipment, devices, et cetera.
 6. Off-site disposal in a legal manner of all materials not requested to be turned over to the Owner. Comply with government regulations pertaining to environmental protection, and disposal of materials and equipment. Do not burn any materials on the site.
 7. Repair of any finishes or adjacent construction damaged during modification, extension, and demolition work.

1.19 EXAMINATION

- A. Verify field conditions including existing systems, equipment models, configurations, circuiting arrangements, cabling, and devices. Adjust all circuiting, cabling, and materials to be provided as required by job conditions.
- B. Project drawings are based on casual field observation and existing record documents when available, report any significant discrepancies to the Engineer before disturbing existing systems.
- C. The Contractor accepts the existing conditions when beginning demolition.

1.20 IMPLEMENTATION

- A. Verify phasing in regard to systems and coordinate before energizing any system.
- B. When required during phases of construction to maintain existing systems in service in particular areas, provide temporary wiring and connections as necessary to accommodate construction.

1.21 OPERATION OF NEW EQUIPMENT PRIOR TO PROJECT COMPLETION

- A. When the phasing of a project requires that electronic safety and security systems are operable in certain areas and the Owner needs to operate the equipment the contractor shall make such provisions. The warranty period shall commence on new equipment when it is operated for the beneficial use of the Owner. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, properly adjust, and complete all punch list items before final acceptance by the Owner. In these cases, the date of acceptance and the start of the warranty may be different dates.

1.22 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment in areas of renovation that are to remain or be reused.

1.23 PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Contractor shall take such precautions as may be necessary to protect his apparatus from damage.
- B. This shall include the creation of all required temporary shelters to protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering.
- C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by the Contractor.

1.24 FINAL OBSERVATION

- A. It shall be the duty of the Contractor to make a careful observation trip of the entire project, assuring themselves that the work on the project is ready for final acceptance before calling upon the Architect/Engineer to make a final observation.
- B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, et cetera, called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of said final observation. The Contractor is cautioned to check over each bond, receipt, et cetera, before preparing for submission to verify that the terms check with the requirements of the specifications.
- C. The following and other provision of Division 1 General Conditions will be required at time of final completion:
 - 1. Final clean up completed.
 - 2. All systems are fully operational, all material and devices installed.
 - 3. As built (as installed) drawings and operations manuals.

1.25 PROHIBITED MATERIALS

- A. No new asbestos, lead, or materials containing these substances shall be permitted in this project. The Contractor shall consult the Architect concerning these materials if their presence is suspected. All work in or around existing asbestos or lead materials is at the sole risk of the Contractor and his personnel.

1.26 CUTTING AND PATCHING

- A. Notify the Builder sufficiently ahead of construction of any floors, walls, ceiling, roof, et cetera, of any openings that will be required for his work.
- B. The Contractor shall see that all sleeves required for his work are set at proper times to avoid delay of the job.
- C. All necessary cutting of walls, floors, partitions, ceilings, et cetera, as required for the proper installation of the work under this Contract shall be done at the Subcontractor or at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the Architect/Engineer.
- D. Patching of openings and/or alterations shall be provided by the Electronic Safety and Security Subcontractor or at the Subcontractor's expense in an approved manner.
- E. No joists, beams, girders, or columns shall be cut by any Contractor without first obtaining written permission of the Architect/Engineer.
- F. All openings in firewalls and floors shall be completely sealed after installation for a completely airtight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.
- G. All openings in exterior walls shall be sealed watertight.
- H. Seal voids around conduits penetrating fire-rated assemblies and partitions using fire stopping materials and methods in accordance with NFPA and local codes.

1.27 MANUFACTURERS' INSTRUCTIONS

- A. All equipment and devices shall be installed in accordance with the drawings and specifications, manufacturer's instructions, and applicable codes.
- B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions.
- C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

1.28 INSTALLATION

- A. Cooperation with trades of adjacent, related or affected materials or operations, and or trades performing continuations of this work under subsequent contracts are considered a part of this work. In order to effect timely and accurate placing of work and to bring together, in the proper and correct sequence, the work of such trades, including work provided under a Division 1 allowance.
- B. The Electronic Safety and Security Contractor shall coordinate installation of the Electronic Safety and Security systems with the Builder, Electrical, Mechanical, and Plumbing Contractors to ensure a complete working system for the Owner.

- C. Where required for accessibility all conduit and boxes for all Electronic Safety and Security systems shall be provided by the Electrical contractor as specified, including systems in Division 28, any and all allowances shall be included. Normally low voltage wiring shall run open and supported in accessible attic space. All low voltage wiring in exposed areas such as gyms, stages, shops, and field houses shall be enclosed in conduit. Coordinate with, and verify with Division 26 to provide required conduit and boxes at locations and heights as required.
- D. Conduit, innerduct, track, or raceway shall conceal and protect wiring in exposed areas, within walls, through in- accessible areas, floors, chases, under slab, crawlspaces, or underground.
- E. All conduit, duct, track, and raceway runs shall be spaced apart to allow for maintenance, such as the installation of couplings, without disturbing adjacent pathways.
- F. All work must be performed by workers skilled in their trade. The installation must be complete whether the work is concealed or exposed.
- G. Provide stainless screw/bolt hardware wherever stainless devices are used and in potentially wet areas.
- H. Coordinate the actual locations of devices and outlets and equipment with building features and mechanical equipment as indicated on architectural, structural, and mechanical drawings. Review with the Architect any proposed changes in outlet or equipment location. Relocation of devices, before installation, of up to 3 feet from the position indicated, may be directed without additional cost. Remove and relocate outlets placed in an unsuitable location when so requested by the Architect.

1.29 ADDITIONAL MATERIALS: INCLUDE IN THE BASE CONTRACT PROPOSAL

- A. All costs to provide 5 additional safety and security device locations including all cable and devices as directed by the Architect. Conduit and standard back boxes by Division 26 Electrical Contractor.

PART 2 – PRODUCTS

- A. Not Applicable

PART 3 – EXECUTION

- A. Not Applicable

END OF SECTION

SECTION 28 13 27

BUILDING ACCESS CONTROL SYSTEM EXPANSION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Expand the existing Owner's S2 Security Building Access Control System as indicated on the project plans.
- B. NOTE: All electric door locks shall be configured for fail-safe un-delayed egress operation and fail-secure to prevent unauthorized entry on loss of power.

1.2 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Provide all equipment, materials, labor, software, licensing, supervision, and services necessary for or incidental to the installation of a card reader operated door access control system expansion, as shown or indicated on the drawings and as specified.
- C. This access control system shall provide for controlled entry doors to be released when a valid credential card is presented to the credential card reader located adjacent to the door. This system shall monitor for unauthorized entry attempts, control access to the building, and log entry information. The system shall in no way impede free emergency exit from the building. Exit from the building shall not require special effort or knowledge.
- D. It shall be the responsibility of this Contractor to obtain all required approvals and certifications from authorities having jurisdiction.
- E. It shall be the responsibility of the Electrical Contractor to provide and install all conduit systems, standard electrical boxes, and operating power for the building access systems as outlined on the project drawings. This Contractor shall coordinate all system requirements with and provide special back boxes to the Electrical Contractor prior to installation of conduit.
- F. The electrical contractor shall provide 120-volt power as required to the security system through separate dedicated branch circuits, maximum 20 amperes each. Each such circuit shall be labeled at the power distribution panel as ACCESS CONTROL. The location of all circuit breakers serving the system shall be posted in the control unit cabinets. Each cabinet shall be grounded securely to the building grounding system.
- G. Provide all testing, documentation, training, and warranty service as outlined in these specifications.

1.3 RELATED SECTIONS

- A. Section 26 05 34 - Provisions For Communication, Security & Safety Systems.
- B. Section 27 10 30 - Data and Telephone Cable Plant.
- C. Section 28 05 00 - General Electronic Safety and Security System Requirements.

1.4 CODES AND REGULATIONS

- A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
- B. The equipment, materials, and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:
 - 1. NFPA 70, National Electrical Code.
 - 2. NFPA 72, National Fire Alarm and Signaling Code.
 - 3. Americans with Disabilities Act.
 - 4. Texas Accessibility Standards.
 - 5. International Building Codes (IBC).
 - 6. Local and State Building Codes.
 - 7. All requirements of the local Authority Having Jurisdiction (AHJ).

1.5 SUBMITTALS

- A. Submittal procedures: See Section 28 05 00.
- B. Submit a complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- C. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- D. Quality Assurance Submittal:
 - 1. Letter from manufacturer stating that the Contractor is an Authorized Factory Distributor for the area where the project is located.
 - 2. The Contractor and Manufacturer shall supply sufficient information to indicate that the proposed system is based on the latest hardware, software technology available.
 - 3. Current copy of the Contractors Electronic Access Control Device Security Company license issued by the Texas Department of Public Safety Private Security Board.
 - 4. Calculations for device circuit current drop and battery backup calculations.
- E. Product Data Submittal including special boxes, cable, and other material as requested by the Architect including:
 - 1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
 - 2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 - 3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
 - 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 - 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 - 6. Any resubmittal shall include a complete revised equipment list and any product data that is revised.

- F. Submit shop drawings locating all components of the system, indicating circuit routing, cable type, and gauge. Shop or coordination drawings shall include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.

1.6 QUALIFICATIONS OF A PROPOSED CONTRACTOR

- A. Proposed contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein described will be disqualified.
- B. The Contractor shall be currently licensed under the Texas Department of Public Safety Private Security Board as an Electronic Access Control Service Installer Company to sell, install, and service private security systems.
- C. The proposed contractor, as a business entity, shall be an authorized distributor and designated representative of the security panel manufacturer, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing commercial building alarm systems for a period of at least 5 years.
- D. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.
- E. All employees working on the project must be registered alarm system installers. The Contractor shall employ factory trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the Contractors submittal.
- F. The contractor shall employ full time local technicians and installers. The manufacturer shall maintain a full time factory employed service staff for product support and service.
- G. The proposed Contractor shall have an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period. The contractor shall be capable of dispatching technicians to repair a system within six hours of a service request.
- H. The proposed contractor shall be fully experienced in the design and installation of the type of security system herein specified and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the project to allow the owner to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.

- I. The Contractor shall employ factory-trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the contractors' submittal.
- J. The Proposed Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A Proposed Contractor that has any prior finding(s) of a code or license violation or has any litigation in process concerning the installation of a communication system is unacceptable.
- K. The ability of a proposed Contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the Contractors' competency and responsibility to meet the requirements and obligations of the contract.
- L. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.
- M. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed Contractor shall furnish to the Owner with any information or data requested for this purpose.
- N. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.
- O. The Owner reserves the right to reject the proposal of any Contractor who has previously failed to perform properly, or complete on time, contracts of a similar nature.

PART 2 – PRODUCTS

2.1 GENERAL

- A. The system provided shall be fully compatible and integrated with the Owners existing system hardware, software, credentials, and credential database.
- B. Provide complete and satisfactorily operating Access Control System as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form a functional system, with components and interconnections matched for optimum performance of specified functions.
- C. The system and all components shall be tested and found suitable for the specified purpose as part of a commercial building security system by a nationally recognized approvals agency acceptable to the AHJ.
- D. The control units, power supplies, batteries, subassemblies, software, firmware, and all cable, devices control units, power supplies, batteries, subassemblies, software, firmware, cable, and all accessories provided shall be listed and labeled by Underwriters Laboratories, Inc. for commercial security system use under the latest appropriate testing standard.
- E. All date keeping hardware, firmware, and software provided shall be fully compliant with the calendar year designated in four-digit date format. Any time equations must function normally, leap year, and daylight savings time must be supported.

- F. Only equipment devices have been shown on the contract drawings. Specific wiring between equipment has not been shown.
- G. The system shall include but not be limited to all control units, power supplies, batteries, subassemblies, card sensors, software, firmware, and all cable, door release equipment, and all accessories required to provide a complete operating system.
- H. All equipment and components shall be installed in strict compliance with manufacturers' recommendations and the requirements of the components UL listing. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, electrical requirements, cable types, and physical equipment sizes, etc., before beginning system installation. Refer to the manufacturers' riser / connection diagrams for all specific system installation/termination/wiring data.
- I. All equipment and components shall be new, and the manufacturer's current model. All like devices shall be of the same manufacturer and model number.
- J. 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.

2.2 ACCEPTABLE BUILDING ACCESS CONTROL SYSTEM MANUFACTURER

- A. Descriptions and details, acceptable manufacturers' names listed, specific manufacturers' model numbers indicated in the project plans and specifications, and other pertinent information herein are intended to establish minimum standards of quality, compatibility, functions, features, and performance of the equipment to be furnished. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose any product substitution must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.
- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified.
- D. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of alternate products shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically ensure products will be an acceptable equivalent.
- E. It is the responsibility of the Contractor to provide all features and functions as outlined in these specifications. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification

- F. The existing system, which is the school District standard, and the manufacturers model numbers, functions, and features described in this specification section are those of the **S2 Security** building access control system with **Mercury Access Technology** hardware, this shall constitute the quality, compatibility, features, and performance of the equipment to be furnished, **no exceptions**. Any other proposed manufactures devices or software must be pre-approved.

2.3 BUILDING ACCESS CONTROL SYSTEM INSTALLATION REQUIREMENTS

- A. Contractors shall provide all material, labor, tools, and equipment required to perform the work described and make complete, safe, and functional systems.
- B. Contractors shall pay for and acquire all permits and inspections required by controlling authority.
- C. All work shall be installed in accordance with state, local, and national codes.
- D. Contractors shall warrant his workmanship and materials for a period of one year from the date of acceptance upon completion of the project.
- E. All work shall be done by mechanics skilled in the particular trade involved, under responsible supervision.
- F. No surface mounted raceway or conduit will be accepted on any new construction job.
- G. Seal all wall and floor penetrations with approved sealant.
- H. Access control system cabling can share conduit with intrusion alarm system cabling.
- I. All cabling must be suspended up off the ceiling grid.
- J. Contractor must provide the Owner with all security equipment MAC addresses and network drop information.
- K. The access control contractor shall provide and install all required parts and local cabling to get the system online and operational; this includes power supplies required to operate the electrified exit devices.
- L. Where 110 Volt electrical receptacles as needed to accommodate system transformers, they shall be provided by the electrical contractor at exact locations coordinated with the access control contractor.
- M. Where 110 Volt electrical receptacles as needed to accommodate door release hardware/ electrified exit devices, they shall be provided by the electrical contractor in an accessible location at 12" above the finished ceiling and within 20 feet of door location.
- N. Data drops shall be provided by the cabling contractor for security equipment. See Section 27 10 30 - Data-Telephone Cable Plant.
- O. Exterior card reader locations shall be prepared including a recessed single-gang weatherproof metal back box located approximately 44" centered from the ground and 12" off the opened door edge to the side, with a ½" secured rigid or flex conduit with pull string to an accessible interior location concealed above the finished ceiling.

- P. Controlled door frames shall be prepared as detailed on the plans including a ½" secured rigid or flex conduit with pull string to an accessible interior location concealed above the finished ceiling.
- Q. Continuous hinges with built in power transfers (concealed ribbon wire) are not acceptable.
- R. Mag-locks are not acceptable.

2.4 RELATED WORK - NETWORK CONNECTIVITY

- A. The system shall utilize the owner's Ethernet system backbone for all security devices communications.
- B. No Ethernet cabling, network RJ-45 jacks, or patch cords are included in the scope of this Specification Section.
- C. The Awarded Contractor from Section 27 will provide this Contractor with a terminated network drop at security devices, and the required TCP/IP configuration settings: static IP address, domain, gateway, and subnet mask.
- D. This contractor will program and test all access control system devices for connection to the network.
- E. This contractor will provide complete programming of all device parameters in accordance with the Owners requirements.
- F. For each building access control system intelligent door controller (network controller) panel requiring an Ethernet network connection, the Division 27 contractor shall provide a dedicated data drop located above the ceiling at the panel location. The building access control system contractor shall provide and install a conduit pathway from the top of the panel up to the ceiling space with plastic snap in bushings at each conduit end or transition used for this connection. The Division 27 contractor shall provide the patch cable, and the building access control system contractor shall route and connect the patch cable between the faceplate jack above the ceiling and the panel Ethernet network connection jack.

2.5 ACCEPTABLE MANUFACTURES

- A. All references to manufacturer's model numbers and other pertinent information herein are intended to establish minimum standards of performance, function, and quality. With approval, equivalent, compatible, UL listed equipment from other manufacturers may be substituted for the specified equipment as long as all requirements are met.
- B. The system herein specified is the **S2 Security Access Control System** software with **Mercury Access Technology** hardware, fully licensed solution, utilizing various door controller model numbers and this shall constitute the functionality, quality, compatibility, and performance of the system to be furnished, **no exceptions**. Any other proposed suppliers' systems must be pre-approved.

2.6 ACCESS CONTROL SYSTEM PANELS/ENCLOSURES

- A. Provide as required, enclosures suitable for surface wall mounting and shall include battery backup power supplies where required. Each enclosure shall include a removable back plate for module mounting, a keyed lock, and tamper switch. Access power enclosures shall include a single AC power connection (for power supply), a pre-wired LSP power section. Each tamper switch shall be wired to a module input circuit for monitoring by the system.

2.7 ACCESS SYSTEM CONTROLLER BOARDS

- A. Provide as required, Mercury Security intelligent controllers and door reader interface sub-modules for the additional doors per the drawings. Utilize existing expansion capabilities of the existing hardware where available.

2.8 ACCESS CONTROL SYSTEM LAYOUT PLANS

- A. The Contractor shall provide a mock-up of the layout plan documents prior to mounting.
- B. Provide mounted inside each Access Control System Panel/Enclosure cover, or adjacent to the panel location, an 8 ½" x 11" laminated layout plan including the following information:
 - 1. In the upper left corner of the layout provide the name of the installing company, phone number and Texas Security License number.
 - 2. In the upper right corner of the page provide the Name of the campus and the MDF or IDF room I.D./location.
 - 3. Under the room I.D. list:
 - a. IP address of the panel
 - b. Subnet mask.
 - c. Gateway IP address
 - 4. Place the service contract information (contact or department and phone number or just phone number will be acceptable).
 - 5. Beneath the common information, provide a line diagram indicating each module location and the name of the device attached to each input on each card.

2.9 CREDENTIAL CARDS

- A. No additional credential cards are required for this scope of work. Employees of the District will utilize their existing credential cards for access to this property.

2.10 PROXIMITY CARD READERS

- A. Controlled access door location as indicated on plans shall be provided with an entry card reader to allow access to authorized individuals as scheduled.
- B. Each proximity card reader shall mount on a standard single-gang electrical wall box or on the surface of an interior or exterior wall.
- C. Outdoor weatherproof back boxes shall be flush mounted and connected to a ½" threaded rigid pipe conduit and sealed. The reader casing shall be grounded to prevent electrostatic discharge from interfering with the operation of the reader.
- D. Threaded conduit is required for outdoor applications and dielectric grease shall be used to coat field connections.
- E. Manufacturer / Model: Provide HID Multiclass SE R40 card readers, match to existing District readers or standards, as required.

2.11 PRIMARY SERVER DATABASE AND PROGRAMMING REQUIREMENTS

- A. This site shall utilize the existing District server. Incorporate the new doors in this construction package into the existing data base.
- B. Include any licensing requirements or fees for using the management software and accompanying client software. The contractor will load the most current software revision being used at the time of the software programming.

- C. District programming requirements for the access control system will require unique and specialized programming. The feature set below will be required customized programming completed by vender of choice.
 - 1. Map navigation will be a complete as-built of the installation to include all access control icons to coincide with actual install.
 - 2. Program integration with the VMS for pop up video on alarm. Reference the drawings for camera locations that are tied to select doors or events.
- D. Programming each panel at the location. Program each panel on the District network, IP addresses and VLAN configuration will be provided by the District.

2.12 AUXILIARY POWER SUPPLY

- A. Manufacturer/Model: Provide Altronix power supplies, Life Safety Power or approved equivalent.

2.13 DOOR SWITCHES (ACCESS SYSTEM DOOR CONTACTS)

- A. Provide door switches where indicated on floor plans with conduit run to a nearby, accessible, junction box located above ceiling.
- B. Door frame flush mount: Provide recessed magnetic contact door switch - GE UTC 1076D-M (brown – bronze color) or 1076D-G (gray color) dual contact DPDT switch to support both access and security system connections with wire leads as required or equivalent.
- C. Doors surface mount, heavy duty armored: Provide magnetic contact door switches - Sentrol, Inc. 2500 series as required or equivalent.

2.14 DOOR RELEASE HARDWARE

- A. Install all wiring and control devices necessary to enable limited access to the indicated points of entry. Each controlled access door shall be fitted with a door switch (above), control relay, and an electric latch or strike. Each controlled door shall be setup to allow entry as permitted by the building access system, to prevent unauthorized entry, and to allow free exit from the building without special knowledge or effort. Magnetic force holding or 'mag' locks are prohibited by this specification.
- B. NOTE: All electric door locks shall be configured for fail-safe un-delayed free egress operation and fail-secure to prevent unauthorized entry on loss of power.
- C. Verify exact hardware requirements with Division 08 and Door Hardware Schedules including door and frame preparation details.
- D. Only when the door hardware does not include an integrated Request-to-Exit Switch, provide a request-to-exit sensor (see below).

2.15 REQUEST-TO-EXIT SWITCH OR SENSOR

- A. The system shall not be programmed to unlock a door automatically from a request to exit signal, as this presents a security breach. The request to exit signal shall be used only to indicate a normal exit status, as opposed to a forced entry. Exit shall be made with the normal door hardware and shall not be impeded or assisted by the electronic system. Exit shall not be affected if the power is off and the battery backup exhausted.

- B. When no request-to-exit switch is provided integrated into the door hardware (see above), provide at the exit side of each controlled door a request-to-exit passive infrared detector with x-y targeting and digital signal processing.
- C. Request-to-Exit Switch Manufacturer / Model: Von Duprin RX option request-to-exit switch or equivalent.
- D. Request-to-Exit Sensor Manufacturer / Model: Provide Kantech T.Rex model P-KT-TREX-LT or Bosch Security Systems DS161-BOSIAF PIR request-to-exit detectors, or equivalent.

2.16 CABLING (PLENUM RATED)

- A. All exposed wiring shall be NEC type CMP, plenum cable.
- B. All exterior cabling shall be in rigid metallic conduit. All connectors must be fastened, tied, and crimped for maximum reliability.
- C. Avoid if at all possible, junctions or splicing - all junctions in cable shall be made by proper splicing techniques in a junction box.
- D. All cabling is to be concealed where construction permits.
- E. This contractor shall provide and install new and unused ASTM bare stranded copper conductor wire per ANSI/NEMA codes. Follow the manufacturer's instructions. All wire shall the type recommended by the manufacturer for security system applications.
- F. All cable shall have a machine printed label located within 2" from every terminal block and within 6" from all other connections utilizing self-laminating flexible vinyl film labels.
- G. Wire gauge shall be selected per circuit based on cable length and current requirements.

LOW VOLTAGE CABLE TYPES

Device	Conductors	Min. AWG	Description
RS-485 Serial Interface*	1-Pair Twisted	24	Overall Shield
Entry Intercom	4-Pair UTP	23	Category 6
Point Contact/Relay	1-Pair Twisted	22	Overall Shield
Two Point Contact/Relay	2-Pair Twisted	22	Overall Shield
Three Point Contact/Relay	3-Pair Twisted	22	Overall Shield
Four Point Contact/Relay	4-Pair Twisted	22	Overall Shield
Five Point Contact/Relay	5-Pair Twisted	22	Overall Shield
Six Point Contact/Relay	6-Pair Twisted	22	Overall Shield
Credential Reader (RS-485)	1-Pair Twisted	24	Overall Shield

Device	Conductors	Min. AWG	Description
Credential Reader (TTL)	6-Wire	18	Overall Shield
Composite	Multi-Conductor	22	Overall Shield
Low Voltage Power Combined	2-Pair Twisted	18	Unshielded
Low Voltage Power or Siren	1-Pair Twisted	18	Unshielded
Low Voltage Power	1-Pair Twisted	16	Unshielded
Low Voltage Power	1-Pair Twisted	14	Unshielded
Low Voltage Power	1-Pair Twisted	12	Unshielded

* Belden 82841 or equivalent up to 4,000' per RS-485 serial circuit.

2.17 CABLE TIES (PLENUM RATED)

- A. HALAR Fluoropolymer plenum rated cable ties shall be furnished and installed to attach wire bundles to supports and for appropriate wire management as required.
 - 1. HALAR wire tie, 4.0", miniature - Panduit PLT1M-C702 or equivalent.
 - 2. HALAR wire tie, 7.4", standard - Panduit PLT2S-C702 or equivalent.
 - 3. HALAR wire tie, 11.6", standard - Panduit PLT3S-C702 or equivalent.

2.18 SURGE AND AMPERAGE PROTECTION

- A. Electrical surge protection shall be provided for all service entrance connections and on each copper pair that connects one building to another (i.e. any other portion of a building complex not under one continuous roof) at both exit points to prevent damage to equipment.
- B. Security system circuit surge protectors shall be mounted in a standard grounded metallic electric box. Shall be Ditek, 12345-A Starky Road, Largo, Florida 34643 model numbers as follow, multiple pair units are available, or equivalent:
 - 1. Part No. DTK-1LVLP-X 2-wire protector for 12 Volt circuits.
 - 2. Part No. DTK-1LVLP-D 2 wire protector for 5 Volt circuits.
 - 3. Part No. DTK-Z8LVLP-GP 8-pair protector for RS-485 circuits.

2.19 CABLE ROUTING, INSTALLATION, AND SUPPORT

- A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the NFPA. Wiring shall meet all state and local electrical code requirements.
- B. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.
- C. Before energizing the system check all cables for correct connections and test for short circuits, ground faults, continuity, and insulation.
- D. In all exposed areas such as gymnasiums, shops, field houses, janitors' closets, or mechanical / electrical rooms all access system cable shall be fully enclosed in conduit.
- E. Access system cables shall be run in conduit stubs from wall boxes to accessible areas above finished ceilings. Conduit shall be required only within walls and concealed spaces to provide access. Provide bushings to protect the cable from damage for conduit ends, box openings, and passage through metal studs.
- F. Access system cables shall be run in bundles above accessible ceilings and supported from building structure by j-hooks, conduit or cable tray. Cabling shall be loosely bundled with cable ties randomly spaced at 30 to 48 inches on center, cable ties shall not be tight enough to deform cabling and shall not be used to support the cabling.
- G. Do not attach any supports to joist bridging or other lightweight members. The support system shall provide a protective pathway to eliminate stress that could damage the cabling.
- H. Mount all equipment firmly in place such that vibration or jarring will not interfere with system operation. Route cable in a professional, neat, and orderly installation.
- I. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

- J. Access system cable must not be fastened to electrical conduits, mechanical ductwork / piping, sprinkler pipes, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel for more than four-feet with line voltage electrical conductors. Access system cables shall not be run loose on ceiling grid or ceiling tiles.
- K. Support shall be provided by mounting appropriate fasteners that may be loaded with multiple cables. If the weight load is carried by the support rod or wire, the support assembly may attach to the ceiling grid for lateral stabilization. The required support wires for the ceiling grid or light fixtures shall not be utilized. Any fastener attached to the ceiling grid shall not interfere with inserting or removing ceiling tiles. The cable pathway of supports must be positioned at least 12 inches above the ceiling grid.
- L. All cable shall have a label on both ends utilizing self-laminating, flexible vinyl film, non-smear, machine printed labels.
- M. Each cable run shall include a three-foot service loop with wire tie located in the ceiling above the control unit panel. This is to allow for future re-termination or repair.
- N. Provide for adequate ventilation to all equipment housings and take precautions to prevent electromagnetic or electrostatic hum.
- O. All conduit, ducts, track, and raceways shall be supported from the structure at industry standard intervals for the size specified, utilizing proper anchoring devices. Cable fill may not exceed the manufacturers' instructions for each type of support.
- P. All conduit, duct, track, and raceway runs shall be spaced apart to allow for maintenance, such as the installation of couplings, without disturbing adjacent pathways.
- Q. Each cable run shall be free of splices. No terminations, splices, or equipment will be installed in or above ceilings.
- R. All cabling will be placed with regard to the environment, EMI/RFI interference, and its effect on communication signal transmission.
- S. Do not route any communication cable within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor or transformer.
- T. Access system cable will not be installed in the same conduit, duct, or track with line voltage electrical cable.
- U. Maximum cable pulling tension shall not exceed 25 pounds force (110 N) or the manufactures recommendation, whichever is less.
- V. Any pulling compounds utilized must be approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.

2.20 TERMINATION PRACTICES

- A. Strip back only as much cable jacket as required to terminate.
- B. Do not "loop" over wiring terminals, the cable could come loose and the condition not be detected as an open circuit or disconnected device.
- C. Preserve wire twists as closely as possible to point of termination (0.5" maximum) to keep signal impairment to a minimum.

- D. Avoid twisting cable jacket during installation.

2.21 BUSHINGS

- A. Provide a plastic snap in bushing at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves prior to cable installation to protect the cabling from damage:
 - 1. Box openings - Thomas & Betts Knockout Bushing Series 3210, or equivalent.
 - 2. Metal stud passage - Thomas & Betts Twist It Bushing Catalog Number SB1216-SC, or equivalent.
 - 3. Conduit ends - Thomas & Betts Anti-Short Bushing Series 390 or Tite-Bite Combination Coupling Series 442, or equivalent.

2.22 CEILING MOUNTED DEVICE BOX HANGERS

- A. All ceiling mounted devices including: smoke detectors, heat detectors, remote power/status LEDs, ceiling mounted strobes and horn/strobes, et cetera, when mounted in a drop ceiling shall be supported by an electrical box hanger (Caddy #512 or #512A for deep boxes - 24" span), or equivalent. Box hangers shall be attached to the ceiling grid only for lateral stabilization, separate support wires shall be provided. The required support wires for the ceiling grid or light fixtures shall not be utilized. The backbox shall be flush and level with the bottom of the ceiling tile and the hole neatly cut for a finished appearance when the device is installed.
- B. Device and box hanger assemblies shall not be supported solely by suspended ceilings. Fasteners and supports shall be adequate to support the required load.

2.23 J-HOOKS

- A. Attachments for cabling support shall be spaced at approximately 48 to 60 inches on center. Each cable bundle shall be routed with enough slack to prevent damage to cables but not allowed to sag more than 12 inches mid-span between attachments. Attachments shall be sized as follows:
Single cables or bundles up to four cables may be supported directly by the building structure.

Bundles up to 1/2" dia. (Ten 1/4" cables)	2" bridle ring, Caddy #4BRT32 or equivalent
Bundles up to 3/4" dia. (Sixteen 1/4" cables)	3/4" J-Hook, Caddy #CAT12 or equivalent
Bundles up to 1-5/16" dia. (Fifty 1/4" cables)	1-5/16" J-Hook, Caddy #CAT21 or equivalent
Bundles up to 2" dia. (Eighty 1/4" cables)	2" J-Hook, Caddy #CAT32 or equivalent

Split bundles greater than 2" dia. or provide cable tray.
- B. Do not mix different signal strength cables on the same J-Hook (i.e. access system with telephone/data cable). Multiple J-Hooks can be placed on the same attachment point, up to the rated weight load of the attachment device.

2.24 COMMUNICATIONS CIRCUIT SURGE PROTECTION

- A. Provide surge protection shall be provided for all exterior devices, communications service or antenna entrance connections, and for each circuit that connects one building to another (i.e. any other portion of a building complex not under one continuous roof) at both entry/exit points to prevent damage to equipment.
- B. Each surge protector shall be mounted in a standard grounded metallic electric box or equipment backboard with a separate ground wire ran directly to the ground bus bar or equipment panel ground stud, do not daisy chain ground wires.

- C. Surge protectors for low voltage communications signal and control circuits with a data rate from 200kbps to 2Mbps, nominal voltage as listed below AC or DC. Each module shall protect up to two pairs using hybrid design multi-stage SAD technology, shall be Ditek 2MHLP series field replaceable modules with MB Series mounting bases for one to five modules, or equivalent, model numbers as follows:
70 to 75 Volt circuit, 4 wire protector with base DTK-2MHLP75BWB.
48 to 50 Volt circuit, 4 wire protector with base DTK-2MHLP48BWB.
36 Volt circuit, 4 wire protector with base DTK-2MHLP36BWB.
24 Volt circuit, 4 wire protector with base DTK-2MHLP24BWB.
12 Volt circuit, 4 wire protector with base DTK-2MHLP12BWB.
0 to 6 Volt circuits, 4 wire protector with base DTK-2MHLP5BWB.
- D. Surge protectors for low voltage communications high data rate voice, data and signaling data and loop circuits, or serial communication, nominal voltage as listed below AC or DC. Each module shall provide Line-Ground (All) protection modes, maximum surge current: 2,000 Amps per pair (6V-50V) or 9,000 Amps per pair (75V-130V), and maximum continuous current: 5 Amps to 0.15 Amps, shall be Ditek LVLP series or equivalent, model numbers as follows:
115 to 130-Volt circuit, 2-pair protector, 10-12 AWG, DTK-2LVLAWGGRUV.
95-Volt circuit, 2-pair protector, 10-12 AWG, DTK-2LVLAWGSGR.
75-Volt circuit, 2-pair protector, 10-12 AWG, DTK-2LVLAWGSPK.
48 to 50-Volt circuit, 2-pair protector, 16-22 AWG, DTK-2LVLPPOPX.
24 to 30-Volt circuit, 2-pair protector, 16-22 AWG, DTK-2LVLPPLV.
12 to 14-Volt circuit, 2-pair protector, 16-22 AWG, DTK-2LVLPX.
0 to 6-Volt circuit, 2-pair protector, 16-22 AWG, DTK-2LVLPD.
0 to 6-Volt circuit, 8-pair protector (RS-485, RS-232), 16-22 AWG, DTK-8LVLPPLVD.
- E. Surge protectors for access control devices, types and nominal voltage as listed below. Each module shall provide Line-Ground (All) protection modes, maximum surge current: 2,000 Amps per pair power and 500 Amps per pair data, and maximum continuous current of 3 Amps, shall be Ditek model numbers as follows or equivalent:
1. Wiegand credential reader surge protection 3-pair, 12 to 14-Volt terminal strip, Ditek DTK-3LVLPX.
 2. Credential reader surge protection, 4-pair reader and 1-pair each: 12-Volt power, 24-Volt power, 5-Volt data, and 1-Volt signal, Ditek DTK-4LVLPCR.
 3. Entry intercom system with data circuit surge protection 1-pair 12/24-Volt power supply, 2-pair 130-Volt voice line, and 1-pair 0 to 6-Volt data circuit, Ditek DTK-4LVTEP.
 4. Entry intercom system with door release surge protection 1-pair 12/24-Volt power supply, 2-pair 130-Volt voice line, and 1-pair 24-Volt release solenoid circuit, Ditek DTK-4LVXR.
- F. Surge protectors for Ethernet network runs rated up to Category 6A and operating at up to 10-Gigabit data rates. Each module shall protect up all four pairs using hybrid design multi-stage SAD technology which shall automatically reset to protect against multiple surges, Ethernet surge protectors shall be Ditek DTK-CAT6A series as follows:
1. DTK-110RJC6APOE with 110 to RJ-45 connections with PoE.
 2. DTK-110C6APOE with 110 to 110 connections with PoE.
 3. DTK-110RJC6A with 110 to RJ-45 connections without PoE.
 4. DTK-110C6A with 110 to 110 connections without PoE.

- G. Surge protectors for analog copper pair PSTN telephone service POTS/Trunk/C.O. line alarm Digital Communicator service lines shall be Ditek DTK-2MHTPWB, or equivalent, 2-pair/lines, maximum ring-up voltage 110V, includes base. In addition, At Telco service connection demarcation point locations servicing an alarm Digital Communicator, provide per line a Suttle Solutions Part # 635B-48, or equivalent, RJ31X surface mount jack with 8-conductor screw terminal board input and factory wired DATA and VOICE labeled, non-keyed RJ-45 output ports, with line seizure port shorting bar (1&4, 5&8) for alarm reporting device service.
- H. Surge protectors for coaxial cable shall be suitable for analog and digital signals up to 2 Ghz, and shall feature 75 Ω nominal impedance, Center Pin - Shield, Shield - Ground protection modes, 20,000A surge current rating, a service voltage of 50VDC, and a clamping Voltage of 75VDC. Note: Insertion loss per surge protection module is 0.5dB, include signal attenuation from these devices in signal strength calculations. Surge protectors shall be Ditek VSP series, or equivalent, as follows:
 - 1. Type 'F' connectors Ditek DTK-VSPA or Ditek DTK-VSPA2 (dual).
 - 2. BNC connectors Ditek DTK-VSPBNCA or DTK-VSPBNCA2 (dual).
 - 3. BNC connectors and 24-volt power connections Ditek DTK-PVP27B.
 - 4. PTZ camera surge protection; BNC video, power and data Ditek DTK-DP4P.
 - 5. HD-SDI video Ditek DTK-iBNCHD.
 - 6. Type 'N' antenna connector Ditek DTK-VSPN.

2.25 FIRE STOPPING, DRAFT/NOISE STOPPING, PENETRATIONS, AND CORING

- A. UL Listed fire stopping methods that match the fire rating of the wall or floor being penetrated are to be used at all fire barrier penetrations. Seal the interior of the conduit sleeve around the cables and around the outside of the sleeve on each side of the penetration with fire-stop caulk or putty, install according to the manufacturers' instructions.
- B. All penetrations through fire rated walls or floors shall feature a suitable length of metal conduit. Hole diameter shall not exceed $\frac{1}{2}$ " larger than the conduit or sleeve to be installed. The hole shall be neatly cut, not oversize or irregular. Do not share wall/floor penetrations with ductwork, piping, line voltage electrical conduits, etc.
- C. All gypsum board or plaster penetrations shall tool cut using an appropriate hole saw / mandrel or manufactured assembly.
- D. Draft/Noise Stopping - All penetrations through non-rated walls shall include draft/noise stopping to minimize the transfer of air and sound between enclosed areas. This shall include but not limited to:
 - 1. Neatly cutting all non-rated wall penetrations with a 1" maximum clearance. All gypsum board or plaster penetrations shall be tool cut using an appropriate hole saw / mandrel or manufactured assembly. The hole shall be neatly cut and not oversize or irregular. Do not share wall penetrations with other types of ductwork, piping, line voltage electrical conduits, communications cabling, etc.
 - 2. Provide and install non-combustible mineral wool, fiberglass, cellulose insulation, caulk, and/or sealant as required. Seal the interior of conduit sleeves around the cables and around the outside of the sleeve on each side of the penetration with caulk or putty, install materials according to the manufacturers' instructions.
- E. The Contractor shall make every effort to coordinate with the building Architect, Engineer, Builder, and Electrical Contractor to have sleeves placed in new construction so that later coring or drilling of building structural members will not be required. The Contractor must consult with the building Architect, Engineer, and Builder prior to drilling, coring, or sawing of any wall, floor, etc. All penetrations shall be made at approved, appropriate, locations.

- F. Upon approval, the Contractor shall be required to supply all labor, equipment, tools, and materials to create any additional penetrations, and shall provide the sleeve, temporary and final fire stopping. Special care shall be taken not to stress, overheat, or penetrate any building support member. Coring shall be made with equipment appropriate for the dry penetration of concrete and block materials. Under no circumstances shall penetrations be made utilizing a chisel or percussion type equipment. Concrete, block, or plaster cores shall be made by dry saw methods only.

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATION

- A. Scheduled automatic door unlocking/locking of specific entry doors shall be programmed to require verification before being enacted. A credential card from a select group at the local facility (including the manager/assistant manager, etc. as requested) must be presented at the facility within a two-hour period prior to the scheduled unlocking event. This is to prevent the entrance doors from being unlocked when no one is present to supervise and unlock the building, such as due to an unavoidable delay or other unscheduled occurrence. If a scheduled unlocking event is delayed, and a credential card from the select group is presented within two hours after the unlocking event was scheduled, the unlocking shall be enacted immediately.
- B. This access control system shall provide for controlled access through entry doors and into restricted areas when a valid credential card is presented to the credential card reader located adjacent to the door, only if the user's group access rights and time schedules allow for access. This system shall monitor for unauthorized entry attempts, control access to the building, and log entry information. The system shall in no way impede free emergency exit from the building. Exit from the building shall not require special effort or knowledge. Controlled door locks shall fail secure from outside entry on loss of power and backup power.
- C. Door Forced and/or Door Held Open alarms shall have the capacity to be locally annunciated via Auxiliary Output relays on the individual controllers. This annunciation shall be controlled as follows. A direct one-to-one relationship shall be able to be programmed between the Door Forced and/or Door Held Open alarm and the auxiliary output. When either condition exists, the auxiliary output is energized. When either condition is cleared, the auxiliary output is de-energized.
- D. Controlled doors using a retractable latch strike shall, on a valid credential card read, activate the output to retract the door latch and immediately allow the exit door to be entered by standard pull lever operation; the door may then be opened without retracting the latch bolt. When the door closes, the latch bolt shall ride over the strike lip. The installation shall include dual switch monitoring, the strike shall have two SPDT contacts; one switch shall monitor the tripper, which is depressed when the latch bolt is inserted into the strike pocket. The second switch shall monitor the condition of the strike lip, indicating open or closed and locked conditions.
- E. Controlled doors with frame or mullion retractable strike, on a valid credential card read, activate the output to retract the door strike and immediately allow the exit door to be entered by standard pull lever operation; the door may then be opened without retracting the latch bolt. When the door closes the beveled latch bolt shall ride over the lip and fall into the electric strike pocket. The installation shall include dual switch monitoring, the strike shall have two SPDT contacts; one switch shall monitor the tripper, which is depressed when the latch bolt is inserted into the strike pocket. The second switch shall monitor the condition of the strike lip, indicating open or closed and locked conditions.

- F. Controlled doors with a crash bar shall include electric latch retraction and a request-to-exit switch, the access control system shall, on a valid credential card read, activate the output to retract the latch bolt and immediately allow the door to be entered by standard pull handle operation.
- G. Where required, the system shall interface with electric door openers utilized for ADA access. This interface shall interconnect to door control interface to mechanically open the door when a valid credential card is read and the exterior door button is pressed. The exterior button shall also open the door when the door is scheduled to be unlocked without a credential card read. The interior door open button shall always be functional, allowing full egress, regardless of the status of the access control system; the interior button shall also be interfaced to the request to exit function.
- H. The request-to-exit switch or sensor shall provide a means for the system to monitor the status of the controlled door and detect a forced entry condition. The request-to-exit signal shall be used only to indicate a normal exit status, as opposed to a forced entry. Exit shall be made with the normal door hardware and shall not be impeded or assisted by the electronic system. Exit shall not be affected if the power is off and the battery backup exhausted.
- I. The access system door contact switch shall provide a means for the system to monitor the open/closed status of the controlled door and detect if the door is held open or left ajar after a valid credential card read.

3.2 TESTING, WARRANTY SERVICE

- A. A factory trained representative of the manufacturer shall supervise the final connections and testing of the system and it shall be subject to the final acceptance of the Architect/Engineer and Owner.
- B. This contractor will thoroughly test all components of the systems and devices proposed herein to assure equipment specifications are met. This contractor will start up, test, and debug systems to ensure that all aspects of the system are working, documented, and reporting properly.
- C. This Contractor shall make a thorough inspection and test of the complete installed security system including all components and controls to ensure the following:
 - 1. Complete and functional system.
 - 2. Installed in accordance with manufacturer's instructions.
 - 3. Verify proper operation and processing of signals.
- D. The installation will be verified through use of testing procedures designed to test all specific functions and requirements of your system under various operating conditions.
- E. This Contractor shall provide a warranty of the installed system against defects in material or workmanship for a period of three (3) years from the date of substantial completion. Any equipment or wiring shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner. All equipment will carry a three-year warranty or manufacturer's warranty whichever is greater."

3.3 DRAWINGS, MANUALS, AND TRAINING

- A. Upon completion of the installation, and prior to final inspection, the Building Access Control Contractor shall furnish four (4) hard copies and one (1) electronic CAD and PDF copy on CD-R of as-built drawings. In addition, the Building Access Control contractor shall furnish four (4) hard copies and one (1) electronic PDF copy on CD-R of a complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide the Owner a copy of the panel control software including the licensed program, site specific data file, and passwords that the Owner may require to maintain the system. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Include copies of all programming sheets used to configure the system. As-built drawings and operating and maintenance manuals may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- B. Provide the Owner a copy of the panel control software including the licensed program, site specific data file, and passwords that the Owner may require to maintain the system.
- C. Formal on-site training sessions shall be conducted by this Contractor. It shall be the responsibility of this Contractor to coordinate time and location of training sessions with the Owner.

END OF SECTION

SECTION 28 21 23

VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Expand the existing IP based video surveillance system, adding new devices and including related work as herein specified and as indicated on the drawings.

1.2 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the expansion the video surveillance, digital recording, security monitoring systems as shown or indicated on the drawings and/or as specified.
- C. The primary purpose of this system is to provide continuous monitoring of entrances, exits, and sensitive areas.
- D. The client software shall provide authorized users password protected network access to live and archive video with extensive search tools.
- E. The system shall consist of one or more Network Video Recorders (NVR's) connected via an Ethernet network to interior and exterior IP cameras. The system shall allow the use of off-the-shelf components including client workstation computers, servers, data storage, and standard PoE Ethernet switches.
- F. All equipment will feature battery backup to allow operation during power outages of at least one hour.
- G. It shall be the responsibility of the Video Surveillance System Contractor to obtain all required approvals and certifications from authorities having jurisdiction.
- H. The Electrical Contractor shall provide a qualified electrical sub-contractor to provide 120-volt power as required to the system through separate dedicated branch circuits, maximum 20 amperes each. Each such circuit shall be labeled at the power distribution panel as SURVEILLANCE SYSTEM. The location of all circuit breakers serving the Video Surveillance System shall be posted in the control unit cabinets. Each cabinet and all surge protection devices shall be grounded securely to the building grounding system.
- I. Provide all testing, documentation, training, and warranty service contract as outlined in these specifications.

1.3 RELATED SECTIONS

- A. Section 26 05 34 - Provisions For Communication, Security, and Safety Systems.
- B. Section 27 10 30 - Data and Telephone Cable Plant.
- C. Section 28 05 00 - General Electronic Safety and Security System Requirements.

1.4 CODES AND REGULATIONS

- A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
- B. The equipment, materials, and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:
 - 1. NFPA 70, National Electrical Code.
 - 2. Americans with Disabilities Act.
 - 3. Texas Accessibility Standards.
 - 4. International Building Codes (IBC).
 - 5. Local and State Building Codes.
 - 6. All requirements of the local Authority Having Jurisdiction (AHJ).

1.5 SUBMITTALS

- A. Submittal procedures: See Section 28 05 00.
- B. Submit a complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- C. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- D. Quality Assurance Submittal:
 - 1. Letter from manufacturer stating that the Contractor is an Authorized Factory Distributor for the area where the project is located.
 - 2. The Contractor and Manufacturer shall supply sufficient information to indicate that the proposed system is based on the latest hardware, software technology available.
- E. Product Data Submittal including special boxes, cable, and other material as requested by the Architect including:
 - 1. A cover sheet with the name and location of the project, the name, address, and telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
 - 2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 - 3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
 - 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 - 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 - 6. Any resubmittal shall include a complete revised equipment list and any product data that is revised.
- F. Submit shop drawings locating all components of the system, indicating circuit routing, cable type, and gauge. Shop or coordination drawings shall include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically

prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.

1.6 QUALIFICATIONS OF A PROPOSED CONTRACTOR

- A. Proposed contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein described will be disqualified.
- B. The proposed Contractor shall be currently licensed by the State Board of Private Investigators and Private Security Agencies to sell, install, and service security systems.
- C. The proposed contractor, as a business entity, shall be an authorized distributor and designated representative of the security panel manufacturer, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing commercial surveillance systems for a period of at least 5 years.
- D. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/ Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.
- E. All employees working on the project must be registered security system installers. The Contractor shall employ factory trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the Contractors submittal.
- F. The proposed contractor shall employ full time local technicians and installers. The manufacturer shall maintain a full time factory employed service staff for product support and service.
- G. The proposed contractor shall provide proof from Wisenet that they are a certified dealer and have locally trained technicians (DFW metroplex) for the manufactured products proposed in this solution.
- H. The proposed contractor will utilize the authorized manufacturer components and distribution channels in provisioning this Project. Contractors must be prepared to submit authorized manufacturer factory training certificates.
- I. The proposed contractor will have a minimum of ten (10) years of recent experience with the proposed manufacturer's products and will provide a letter of validation from the manufacturer.
- J. The proposed contractor shall have previous project experience within the McKinney Independent School District.
- K. The proposed contractor will comply with all federal, state and local statutes regarding qualifications of firms.
- L. The proposed contractor will have adequately trained personnel in the usage of such tools and equipment and will provide a quantity of certified technicians as part of their submittal response. A certified technician will remain a part of the installation and programming team for the entire duration of this project.

- M. The contractor must have previously established offices located within 120 miles of the Owners Administration Building, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period. The contractor shall be capable of dispatching technicians to repair a system within six hours of a service request.
- N. The proposed contractor shall provide proof of licensing by the Texas Board on Private Security run by the Department of Public Safety.
- O. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed Contractor shall furnish to the Owner with any information or data requested for this purpose.
- P. The Proposed Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A Proposed Contractor that has any prior finding(s) of a code or license violation, or has any litigation in process concerning the installation of a communication system is unacceptable.
- Q. The Owner reserves the right to reject bid of any bidder who has previously failed to perform properly, or complete on time, contracts of a similar nature.
- R. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.
- S. The proposed contractor shall have bonding capacity with bid bond, payment/performance bond to support the total value of the project.
- T. The proposed contractor shall provide (3) examples of similar size & scope projects specifically within the K-12 market.
- U. The proposed contractor shall provide a proposed project implementation team, including resumes.
- V. The proposed contractor shall provide a proposed Installation Schedule.
- W. The proposed contractor shall have a 24/7 service hotline with a 4hour onsite response time.
- X. The proposed contractor shall be fully experienced in the design and installation of the type of security system herein specified, and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.
- Y. The Contractor shall employ factory-trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the contractors' submittal.

- Z. The ability of a proposed Contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the Contractors' competency and responsibility to meet the requirements and obligations of the contract.
- AA. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.

PART 2 PRODUCTS

2.1 GENERAL

- A. Provide complete and satisfactorily operating Video Surveillance System as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- B. The system shall support future connection of security system input devices that may include motion detectors, door/window contacts, and/or building security, access, or intercom system alarm/alert conditions. Contact output devices and interconnect cabling are not specified in this section.
- C. All field wiring shall be individually supervised for opens or shorts to security devices.
- D. The system and all components shall be tested and found suitable for the specified purpose as part of a commercial security surveillance system by a nationally recognized approval agency acceptable to the AHJ.
- E. All date keeping hardware, firmware, and software provided shall be fully compliant with the calendar year designated in four-digit date format. Any time equations must function normally, leap year, and daylight savings time must be supported.
- F. The control units, power supplies, batteries, subassemblies, software, firmware, and all cable, detection, and notification devices control units, power supplies, batteries, subassemblies, software, firmware, and all cable, cameras, recording equipment, and all accessories provided shall be listed and labeled by Underwriters Laboratories, Inc. for commercial security system use under the latest appropriate testing standard including but not limited to the following:
 - UL 13 Power Limited Circuit Cables
 - UL 50 Enclosures for Electrical Equipment.
 - UL 444 Communications Cables.
 - UL 497B Protectors for Data Communications and Fire Alarm Circuits.
 - UL 603 Power Supplies for Use with Burglar-Alarm Systems.
 - UL 634 Connectors and Switches for Use with Burglar-Alarm Systems.
 - UL 639 Intrusion Detection Systems.
 - UL 910 Test for Cable Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air.
 - UL 983 Surveillance Camera Units
 - UL 1479 Fire Tests of Through-Penetration Firestops.
 - UL 1581 Electrical Wires, Cables, and Flexible Cords.
 - UL 60950-1 Standard on Information Technology Equipment Safety.

- G. The system shall include but not be limited to all control units, power supplies, batteries, subassemblies, keypads, software, firmware, and all cable, detection, notification, and all accessories required to provide a complete operating system.
- H. All equipment and components shall be installed in strict compliance with manufacturers' recommendations and the requirements of the component's UL listing. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, electrical requirements, cable types, and physical equipment sizes, etc., before beginning system installation. Refer to the manufacturers' riser / connection diagrams for all specific system installation / termination / wiring data.
- I. All equipment and components shall be new, and the manufacturer's current model. All like devices shall be of the same manufacturer and model number.
- J. 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.
- K. Only equipment devices have been shown on the contract drawings. Specific wiring between equipment has not been shown.
- L. Installation is subject to approval, inspection, and test of the Architect/Engineer.

2.2 ACCEPTABLE MANUFACTURES

- A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose any product substitution must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.
- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified.
- D. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of alternate products shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically ensure products will be an acceptable equivalent.
- E. It is the responsibility of the Contractor to provide all features and functions as outlined in these specifications. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.
- F. It is the responsibility of the Contractor to provide all features and functions as outlined in these specifications. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

- G. The system herein specified incorporates **Wisenet WAVE Enterprise Video Management Software (VMS) with fully licensed solution with Wisenet IP Cameras**, and this shall constitute the functionality, quality, compatibility, and performance of the system to be furnished, **no exceptions**. Any other proposed suppliers' systems must be pre-approved.

2.3 RELATED WORK - NETWORK CONNECTIVITY

- A. Refer to Section 27 10 30 - Data and Telephone Cable Plant for all Ethernet network drop connections. All Ethernet cabling and jacks used to connect to the building network shall be provided as indicated on the plans under Section 27 10 30. All system devices provided in this section that require a network connection shall be coordinated with contractor.
- B. All system devices provided in this section that require a network connection shall be coordinated with district IT department to be assigned TCP/IP configuration settings including a static IP address, domain, gateway, and subnet mask.
- C. This contractor will implement all device network configuration and device programming required to provide a complete and functional system under this specification including any special connecting network jumpers and all other types of cabling, and interconnect wires and cables required.

2.4 NETWORK VIDEO MANAGEMENT SOFTWARE (NVMS)

- A. Expand the existing system to accommodate all new devices added including programming for similar and appropriate operation and performance, provide additional licensing as required.
- B. The IP network based security digital Video Surveillance System, hereafter "System", shall allow the display of live, record and playback of digital video streams from multiple video surveillance IP cameras, simultaneously, on the System's operator console software and/or on other display and control platforms including clients, virtual matrix display, PDA and Cell phone.
- C. The Network Video Management Software (NVMS) shall be an enterprise level software solution that shall be scalable from one client, server, and camera to hundreds of clients, servers, and cameras.
- D. The System shall authenticate users before granting access to the system. Access rights for each user shall be able to be defined individually for each user group.
- E. The system shall utilize a fully licensed Wisenet Wave Enterprise Video Management Software (VMS) suite including applications providing:
 - 1. Server and Administrative Operations
 - 2. Monitor Station Client
 - 3. Web Client
 - 4. Mobile User Client
- F. The suite shall provide a comprehensive video management software solution supporting IP camera surveillance environments and include sets of view layouts and facility maps grouped in a hierarchy using structured views.
- G. Active Directory/LDAP User and Group memberships shall securely provide authorized users with flexibility to view, control, search, and export video incorporation a CheckSum Watermark from any client application. The system shall support optional Microsoft SQL integration. The client applications shall connect through the network to the Server for live and recorded video and shall not require direct connect to individual cameras.

2.5 LICENSING

- A. The contractor shall include all required licensing.

2.6 NETWORK VIDEO RECORDERS (NVR)

- A. Utilize the Districts existing video surveillance equipment. Expand as necessary to accommodate the additional IP cameras.

2.7 IP NETWORK VIDEO SURVEILLANCE CAMERAS

- A. Each camera provided shall be in compliance with industry certifications and standards including Class B Electromagnetic Emissions Certifications, Class B Electromagnetic Immunity Certifications, and UL 60950 Certification.
- B. Each camera shall feature a 100/1000 Ethernet-port with standard RJ-45 socket and meet IEEE 802.3af (Power over Ethernet) up to IEEE 802.3at Class 4 PoE Plus, IEEE 802.1X (Authentication), IPv4 (RFC 791) and IPv6 (RFC 2460) network standards.
- C. Provide Wisenet IP cameras were shown on the drawings:
 - 1. 5MP IR Dome Interior Camera, model XND-8020R.
 - 2. 5MP IR Dome Exterior Camera, model XNV-8020R.
 - 3. 8MP (2Mx4ea.) Multi-sensor 360° Camera, model PNM-9080VQ.
 - 4. Fisheye Camera, model XNF-8010R.
- D. Provide accessories as required:
 - 1. SHD-3000F4 flush housing.
 - 2. SBP-201HM, SBP-300HM5, SBP-300HM6, SBP-317HM hanging mounts.
 - 3. SBP-300WM1 mounting arm.
 - 4. SBP-300B wall mount base.
 - 5. SBP-300KM wall corner mount.

2.8 CABLING

- A. See Section 27 10 30 - Data and Telephone Cable Plant. The Surveillance system contractor shall provide all necessary jumper cabling to interconnect the network video recording hardware and network video Ethernet PoE switches with building LAN network. Standard patch cables at camera locations and network closet patch panels shall be provided by data cable plant contractor.
- B. All exterior cabling shall be in rigid metallic conduit. All connectors must be fastened, tied, and crimped for maximum reliability.
- C. All cabling is to be concealed where construction permits.

2.9 COMMUNICATIONS CIRCUIT SURGE PROTECTION

- A. Provide surge protection shall be provided for all exterior devices, communications service or antenna entrance connections, and for each circuit that connects one building to another (i.e. any other portion of a building complex not under one continuous roof) at both entry/exit points to prevent damage to equipment.
- B. Each surge protector shall be mounted in a standard grounded metallic electric box or equipment backboard with a separate ground wire ran directly to the ground bus bar or equipment panel ground stud, do not daisy chain ground wires.

- C. Surge protectors for low voltage communications signal and control circuits with a data rate from 200kbps to 2Mbps, nominal voltage as listed below AC or DC. Each module shall protect up to two pairs using hybrid design multi-stage SAD technology, shall be Ditek 2MHLP series field replaceable modules with MB Series mounting bases for one to five modules, or equivalent, model numbers as follows:
 - 1. 70 to 75 Volt circuit, 4 wire protector with base DTK-2MHLP75BWB.
 - 2. 48 to 50 Volt circuit, 4 wire protector with base DTK-2MHLP48BWB.
 - 3. 36 Volt circuit, 4 wire protector with base DTK-2MHLP36BWB.
 - 4. 24 Volt circuit, 4 wire protector with base DTK-2MHLP24BWB.
 - 5. 12 Volt circuit, 4 wire protector with base DTK-2MHLP12BWB.
 - 6. 0 to 6 Volt circuits, 4 wire protector with base DTK-2MHLP5BWB.
- D. Surge protectors for Ethernet network runs rated up to Category 6A and operating at up to 10-Gigabit data rates. Each module shall protect up all four pairs using hybrid design multi-stage SAD technology which shall automatically reset to protect against multiple surges, Ethernet surge protectors shall be Ditek DTK-CAT6A series as follows:
 - 1. DTK-110RJC6APOE with 110 to RJ-45 connections with PoE.
 - 2. DTK-110C6APOE with 110 to 110 connections with PoE.
 - 3. DTK-110RJC6A with 110 to RJ-45 connections without PoE.
 - 4. DTK-110C6A with 110 to 110 connections without PoE.
- E. Surge protectors for coaxial cable shall be suitable for analog and digital signals up to 2 Ghz, and shall feature 75 Ω nominal impedance, Center Pin - Shield, Shield - Ground protection modes, 20,000A surge current rating, a service voltage of 50VDC, and a clamping Voltage of 75VDC. Note: Insertion loss per surge protection module is 0.5dB, include signal attenuation from these devices in signal strength calculations. Surge protectors shall be Ditek VSP series, or equivalent, as follows:
 - 1. Type 'F' connectors Ditek DTK-VSPA or Ditek DTK-VSPA2 (dual).
 - 2. BNC connectors Ditek DTK-VSPBNCA or DTK-VSPBNCA2 (dual).
 - 3. BNC connectors and 24-volt power connections Ditek DTK-PVP27B.
 - 4. PTZ camera surge protection; BNC video, power and data Ditek DTK-DP4P.
 - 5. HD-SDI video Ditek DTK-iBNCHD.
 - 6. Type 'N' antenna connector Ditek DTK-VSPN.

2.10 ALL EQUIPMENT SHALL BE LOCATED AND INSTALLED AS FOLLOWS

- A. Mount all equipment firmly in place. Route cable in a professional, neat and orderly installation.
- B. All equipment shall be placed with regard to the environment, EMI/RFI interference, and its effect on communication signal transmission.
- C. Do place any equipment within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor or transformer.
- D. No terminations, splices, or equipment shall be installed in or above ceilings.
- E. Provide for adequate ventilation for all equipment and take precautions to prevent electromagnetic or electrostatic hum.

PART 3 - EXECUTION

3.1 TESTING, WARRANTY, SERVICE

- A. A factory trained representative of the manufacturer shall supervise the final connections and testing of the system and it shall be subject to the final acceptance of the Architect/Engineer and Owner.
- B. The Video Surveillance System Contractor shall make a thorough inspection and test of the complete installed system including all components such as motion detectors, and controls, to ensure the following:
 - 1. Complete and functional system.
 - 2. Installed in accordance with manufacturer's instructions.
 - 3. Confirm at the headend, with an ohm meter, that each cable run is not open or shorted prior to connection of equipment.
 - 4. Confirm that each camera is located, properly aimed, and focused for the intended coverage area.
 - 5. Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 - 6. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense.
 - 7. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- C. The Contractor shall provide a single written document outlining the warranty of the manufacturers products to be free from defects in materials and workmanship for a period of no less than three (3) years, starting with the date of substantial completion.
- D. The manufacturer shall provide any software maintenance patches and version updates or upgrades at no-additional cost to Owner for a period of at least five (5) years, starting with the date of substantial completion.
- E. The contractor shall provide a warranty of the installed system against defects in material or workmanship for a period of one (1) year from the date of substantial completion. Any equipment or wiring shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner. All equipment will carry a one year warranty or manufacturer's warranty whichever is greater.

3.2 DRAWINGS, MANUALS, AND TRAINING

- A. As-built drawings and operating and maintenance manuals may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- B. Upon completion of the installation, and prior to final inspection, the Contractor shall furnish as-built drawings.
- C. In addition, the contractor shall furnish complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Include copies of all programming sheets used to configure the system.

- D. Provide the Owner a copy of the system software including the licensed program, site specific data file, and passwords that the Owner may require to maintain the system.
- E. Formal on-site training sessions shall be conducted by the Video Surveillance System contractor. It shall be the responsibility of the Contractor to coordinate time and location of training sessions with the Owner. Provide documented general instruction as follows:
 - 1. Provide instruction to the maintenance personnel to include the location, inspection, normal maintenance, testing, and operation of all system components. Provide a minimum of four (4) hours—two 2-hour sessions separated by a minimum of two weeks.
 - 2. Provide instruction to designated personnel on the functions and operation of the system provided including capabilities, limitations, and the meaning of status messages. State the proper procedure for testing, routine maintenance, and request for service. Provide detailed instruction on the operation of the system operation. Provide a minimum of four (4) hours—two 2-hour sessions separated by a minimum of two weeks.

END OF SECTION

SECTION 28 3100

FIRE ALARM MULTIPLEX SYSTEMS

(PERFORMANCE SPECIFICATION)

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

- A. Provide for the design and installation of the fire alarm system, with suggested minimum device coverage as indicated. Additional devices may be required for NFPA approved coverage based on conditions not known at the time of issue.
- B. Provide Surge Protection Devices (SPDs) / TVSS surge suppression as required by NFPA 72 for all underground circuits.
- C. 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.
 - 10. Provide integrated dialer for outside monitoring of facility.
 - 11. Interface to Kitchen Hood Fire Extinguishing System.
 - 12. Interface to Fire Doors and associated release mechanisms.
 - 13. Door Hold Open devices and release mechanisms.
 - 14. Provide integrated IP Fire Alarm Communicator, UL Listed for monitoring
 - 15. Provide Farenhyte VisorALARM PLUS IP Receiver.
 - 16. Provide integrated UDAC for Outside Monitoring to transmit system status Monitoring Service.
- D. System shall consist of the following components or their functional equivalents:
 - 1. Microprocessor based central processing unit.
 - 2. Remote Annunciator Panels. (Quantity as indicated on plans)
 - 3. Annunciator.
 - 4. Automatic detecting devices.
 - 5. Manual devices.
 - 6. Alarm and warning devices.
- E. Fire alarm system shall be expandable by the addition of the required modules to the basic system.
- F. Each zone shall consist of not more than eight manual or automatic devices.

- G. Auditorium or public assembly zones shall be capable of individual switching in the projection booth, stage area, or other designated area to comply with appropriate sections of NFPA 101 regarding assembly occupancies.
- H. 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.
- I. 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.
- J. At the time of Bidding, provide unit cost for owner directed changes for the following devices:
 - 1. Smoke Detectors
 - 2. Audio / Visual Devices
 - 3. Visual Only Devices
 - 4. Duct Detectors
 - 5. Pull Stations
- K. Contractor to design and provide all equipment, accessories, and materials in accordance with the contract documents to provide a complete and operating system.
- L. 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.
- M. System to be designed in accordance with all applicable codes including local ordinances, by an experienced and licensed Fire Alarm designer.
- 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.
 - 2. Provide DACT provisions for Outside Monitoring to transmit system status. Transmission format shall be verified with the Owner before programming. Services for Outside Monitoring by Owner under separate contract.
 - a. Provide GSM backup on dialer.
- Q. The Fire Alarm Installation Contractor shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm

System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications. The installing contractor is responsible for meeting all required local and national codes.

- R. This section of the specification includes the final design, 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 specified herein. The extent of fire alarm system work required is 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.
 - 2. Services for Outside Monitoring by Midlothian ISD under separate contract.
- S. The contractor shall be an authorized provider and installer of the specified equipment, and shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications.
- T. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.
- U. The contractor shall utilize the final, approved current campus building and room identification for programming of fire alarm zones. Devices shall be labeled with building names and either room names, numbers or both as directed by the owner.
- V. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.
- W. Provide for the design and installation of the fire alarm system, with suggested minimum device coverage as indicated. Additional devices may be required for NFPA approved coverage based on conditions not known at the time of issue.
- X. Provide an integrated tie-in of the addressable Fire Alarm system to the Building DDC Building Control system, as follows:
 - 1. Upon detection of smoke at any duct smoke detectors (where required by NFPA 134 or local code), provide fan shut-down for the all of the air handlers noted to have a supply drop serving that local area.
 - 2. Fire Alarm Contractor shall coordinate all required work with the Building Automation contractor for this tie-in.
- Y. 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 coordinate with the mechanical contractor for all required work related to air handler fan shut-down.
 - 2. Fire Alarm Contractor shall provide all duct detector devices, enclosures to the mechanical for installation, and the mechanical contractor shall provide fan shut down.

1.02 SCOPE OF THE WORK

- A. An intelligent reporting, microprocessor controlled fire detection and emergency alarm communication system shall be installed in accordance with the specifications, and all applicable codes.
- B. The system shall be designed such that each signaling line circuit (SLC) shall be limited to only 80% of its total capacity used during the initial installation.
- C. The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).
- D. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.
- E. Coordinate with District for availability and set up of monitoring telephone lines.

1.03 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.

1.04 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.

1.05 QUALITY ASSURANCE

- A. Provide fire alarm system produced by one of the following manufacturers, while meeting or exceeding the minimum performance specification included herein.

1. Honeywell – Farenhyte, Black Series, is the preferred manufacturer of the fire alarm system, acceptable equal by;
 - a. Other approved in writing prior to bid.
- B. Provide electrical products which have been tested, listed and labeled by Underwriters Laboratories, Inc., and which comply with NEMA Standards.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.

H. 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.

I. 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.

J. 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.

1.06 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

2.01 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.

2.02 MAIN FIRE ALARM CONTROL PANEL AND FIRE COMMAND CENTER:

A. Control Panel

1. Control Panel with Emergency Communications System

- a. The fire alarm control panel (FACP) shall be the Farenhyt IFP-50 addressable control panel. The FACP must have a 2.5 amp power supply and be capable of expansion to a maximum of 50.5 total amps via bus connected expander modules that supervise low battery, loss of AC and loss of communication.
- b. The FACP must be capable of supporting 50 addressable points. The communication protocol on the SLC loop must be digital. The use of shielded cable or twisted pair is not required.
- c. The panel must have a built in 80 character LCD annunciator with the capability of having an additional eight supervised remote annunciators connected in the field.
- d. The FACP must have Day/Night sensitivity capabilities on detectors and be capable of supporting 50 analog addressable points. The FACP must support a minimum of two programmable notification circuits.
- e. The FACP must have a built in UL approved digital communicator. The communicator must allow local and remote up/downloading of system operating options, event history, and detector sensitivity data. The FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.
- f. The FACP must compensate for the accumulation of contaminants that affect detector sensitivity (Drift Compensation). The FACP must have a maintenance alert feature (differentiated from trouble condition). The panel shall indicate a "Maintenance Alert" which means that the detector is still in an operational condition but should be cleaned before it enters a "Trouble" condition in which it will no longer function properly.
- g. The FACP shall have a Jumpstart feature that can automatically enroll all properly connected and addressed accessories into a functional system without further programming. This is required by UL 864. Panels that do not have this feature will not be acceptable.
- h. The main communication bus (SBUS RS485) shall be a class B configuration with a total Bus length of 6,000 feet. This communications bus must be fully supervised.

B. System Wiring

1. The Signaling Line Circuit (SLC) and data communication bus (SBUS) shall be wired with standard NEC 760 compliant wiring. No twisted, shielded or mid-capacitance wiring is required for standard installations. All FACP screw terminals shall be capable of accepting 14-18 AWG wire. All system wiring shall be in accordance with the requirements of NFPA 70, the National Electrical Code (NEC) and also comply with article 760 of the NEC.

C. Signaling Line Circuits

1. The SLC shall be capable of a wiring distance of 10,000 feet from the SLC driver module and be capable of supporting 50 devices. The communication protocol to SLC devices must be digital. Any SLC loop device, which goes into alarm, must interrupt the polling cycle for priority response from the FACP. The FACP must respond consistently to a device that goes into alarm on an SLC in under 3 seconds. The SLC shall be capable of functioning in a class A or class B configuration.

D. SLC Loop Devices

1. Devices supported must include photoelectric, ionization smoke detectors, heat detectors, contact monitoring modules and relay output modules. There is to be no limit to the number of any particular device type up to the maximum of 50 that can be connected to the SLC.

E. Addressable Detector Functions

1. The products of combustion detectors must communicate analog values using a digital protocol to the control panel for the following functions:
 - a. Automatic compliance with NFPA 72 standards for detector sensitivity testing.
 - b. Drift compensation to assure detector is operating correctly.
 - c. Maintenance alert when a detector nears the trouble condition
 - d. Trouble alert when a detector is out of tolerance
 - e. Alert control panel of analog values that indicate fire.
- F. Programmable Notification Circuits
 1. The FACP shall support 2 programmable notification circuits that are capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, resettable or door holder power. These circuits can be configured as 2 Class B outputs or 1 Class A output.
- G. Built-in Annunciators
 1. The main control must have a built in annunciator with an 80 character LCD display and feature LED's for General alarm, Supervisory, System trouble, System silence, and Power. When in the normal condition the LCD shall display time and date based on a 200-year clock which is capable of automatic daylight savings time adjustments. The annunciator must be able to Silence, Acknowledge, and Reset alarms through the use of the keypad. The annunciators must be able to program up to 20 levels of user codes that will allow the limitation of operating system programming to authorized individuals.
- H. Remote Annunciators
 1. The fire system shall be capable of supporting up to eight remote LCD and eight LED remote annunciators. LED Remote annunciators shall have individually mapped LED's and reset and silence inputs. The reset and silence inputs must use the same firefighters key as the remote LCD annunciators. Remote annunciators shall be capable of operating at a distance of 6,000 feet from the main control panel on unshielded non-twisted cable.
 2. The fire system shall be able to support up to eight I/O modules on the SBUS that shall be used to drive remote LED graphic style displays and accommodate up to eight dry contact type switch inputs. The I/O modules shall each drive up to 40 LEDs without requiring external power connections. The I/O module inputs shall be supervised and shall be suitable for alarm and trouble circuits as well as reset and silence switches.
- I. Serial/Parallel Interface
 1. The fire system shall be capable of supporting up to two serial/parallel interfaces (SK5824) that are capable of driving standard computer style printers. The interface shall be programmable for the serial and parallel ports and allow printing of events as they occur.
- J. Distributed Power Modules
 1. The fire system shall be capable of supporting up to eight Power Modules that provide 6 additional amps of power each. Each Power Module shall support 4 or 6 notification circuits not to exceed 6 amps total including the notification circuits. The notification circuits shall be capable of being programmed as described in paragraph 2.1.6 of this document.
- K. Digital Communicator
 1. The digital communicator must be an integral part of the control panel and be capable of reporting all zones or points of alarm, supervisory, and trouble conditions as well as all system status information such as loss of AC, low battery, ground fault, and loss of supervision to any remote devices with individual and distinct messages to a receiving point. The communicator must also be capable of up/downloading of all system programming

options, Event history and Sensitivity compliance information to a PC on site or at a remote location. The communicator shall have an answering machine bypass feature that will allow the panel to respond to communication even on phone lines that have other communication equipment present. The communicator must be capable of reporting via SIA and Contact ID formats. The communicator shall have a delayed AC loss report function which will provide a programmable report delay plus a 10-25 min random component to help ease traffic to the central station during a power outage.

L. Dry Contacts

1. The FACP shall have three form "C" dry contacts, one will be dedicated to trouble conditions, the other two will be programmable for alarm, trouble, supervisory, notification, pre-alarm, waterflow, manual pull, aux. 1 or aux. 2 conditions. The trouble contact shall be normal in an electrically energized state (fail-safe) so that any total power loss (AC and Backup) will cause a trouble condition. In the event that the Microprocessor on the FACP fails the trouble contacts shall also indicate a trouble condition.

M. Ground Fault Detection

1. A ground fault detection circuit shall be employed which can detect a ground fault on both the positive and negative side of each circuit. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. Ground faults shall not interfere with normal operation, such as alarm, or other trouble conditions.

N. Overcurrent Protection

1. All low voltage circuits will be protected by microprocessor controlled power limiting or have self-restoring polyswitches for the following: smoke detector power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.

O. Test Functions

1. A "Lamp Test" mode shall be a standard feature of the fire alarm control panel and shall test all LED's and the LCD display on the main panel and remote annunciators.
2. A "Walk Test" mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function so that each alarm input tested will operate the associated notification appliance for six seconds. The FACP will then automatically perform a reset and confirm normal device operation. The event memory shall contain the information on the point tested, the zone tripped, the zone restore and the individual points return too normal.
3. A "Fire Drill" mode shall allow the manual testing of the fire alarm system notification circuits. The "Fire Drill" shall be capable of being controlled at the main annunciator, remote annunciators and via a remote contact input.
4. A "Disable Mode" shall allow for any zone, point, group, or nac circuit to be Disabled without affecting the operation of the total fire system. A Lamp Test mode shall be a standard feature of the fire alarm control panel and shall test all LEDs and the LCD display on the main panel and remote annunciators.

P. Remote Input Capabilities

1. The control panel shall have provisions for supervised switch inputs for the purpose of Alarm reset and Alarm and Trouble silence.

Q. Notification Appliance Mapping Structure

1. All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 125 output groups. Each of these groups shall have the ability to be triggered by any of the panels 125 zones. A group may be triggered from a zone individually, or may contain a global trigger for manual pull stations, fire drills and two different system alarms. Additionally each zone will individually control the cadence pattern of each of the groups that it is "Mapped" to so that sounders can indicate a variety of

conditions. The zone shall be capable of issuing a different cadence pattern for each of the groups under its control. The mapping structure must also allow a group to be designated to “ignore cadence” for use with strobes and other continuous input devices. Zones shall have eight different output categories; Detector alarm, Trouble, Supervisory, Pre-alarm, Waterflow, Manual pull, Zone auxiliary one and Zone Auxiliary two. Each of the categories shall have the ability to control from 1 to 8 output groups with a cadence pattern. The patterns are; March code, ANSI 3.41, Single Stroke Bell Temporal, California code, Zone 1 coded, Zone 2 coded, Zone 3 coded, Zone 4 coded, Zone 5 coded, Zone 6 coded, Zone 7 coded, Zone 8 coded, Custom output pattern 1, Custom output pattern 2, Custom output pattern 3, Custom output pattern 4 and Constant. In addition, synchronization is built-in for Amseco, Gentex, System Sensor, and Wheelock devices. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules.

R. On-board Programmer

1. The FACP shall have an on board programmer which will allow for all system functions and options to be programmed. Any panel that does not have this capability will not be accepted.

S. Downloading Software

1. The fire alarm control panel must support up/downloading of system programming from a PC under Windows or NT environments. The FACP must also be able to upload the detector sensitivity test results and a 1000 event system event buffer to the PC. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator and shall not require an external modem to be connected to the panel. The downloading software shall contain a code that will block unauthorized persons from accessing the panel via direct connection or over the phone lines.

T. Facility Management Software

1. The FACP must support a facility management capable of providing off site access to FACP data that is necessary to manage fire system operation. A software package capable of uploading the detector sensitivity test results and the 1000 event system event buffer to the PC shall be required as part of the bid package. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator. The facility management package must be separate from the downloader package and must not be capable of affecting programmed system options

U. English Language Descriptions

1. The FACP shall provide the ability to have a text description of each system device, input zone and output group on the system. The use of individual lights to provide descriptions will not be acceptable.

2.03 System Operations

A. Alarm

1. When a device indicates an alarm or supervisory condition the control panel must respond within 3 seconds. The General Alarm or Supervisory Alarm LED on the annunciator(s) shall light and the LCD shall prompt the user as to the number of current events. All notification circuits associated with the alarm or supervisory condition shall activate. If the digital dialer is being utilized it shall transmit a signal to the digital alarm receiving unit. The alarm shall also cause the appropriate door holders and air handlers to shut down. If employed all elevators shall return to the main level or an alternate level when required by the elevator specification or building code. The alarm information must be stored in event memory for

later review. Event memory shall be available at the main and all remote annunciators. The alarm memory must be capable of storing up to 1000 events.

2. When the alarmed device is restored to normal, the control panel shall be required to be manually reset to clear the alarm condition, except that the alarms may be silenced as programmed.
 - a. *Exception: When detectors are utilized in single station or multi-station applications they may be self-restoring.*
3. An alarm shall be silenced by pressing Silence at the main panel or by a code or Firefighter key at the remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur (subsequent alarm feature). When alarms are silenced the silenced LED on the control panel, and on any remote annunciators shall remain lit, until the alarmed device is returned to normal.

B. Trouble

1. When a device indicates a trouble condition, the control panel System Trouble LED should light and the LCD should prompt the user as to the number of current events. The trouble information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
2. When the device in trouble is restored to normal, the control panel shall be automatically reset. The trouble restore information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators. A trouble shall be silenced by pressing Silence at the main panel or by a code or Firefighter key at the remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur.

C. Supervision Methods

1. The SLC loop shall be electrically supervised for opens and ground faults in the circuit wiring, and shall be so arranged that a fault condition on any loop will not cause an alarm to sound. Additionally, every addressable device connected to the SLC will be supervised and individually identified if in a fault condition. The occurrence of any fault will light a trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

D. System Cabinet

1. Mounting
 - a. The system cabinet shall be red and configured for surface mounting.

E. Audible System Trouble Sounder

1. An audible system trouble sounder shall be an integral part of the control unit. Provisions shall also be provided for an optional supervised remote trouble signal.

F. Power Supply and Charger

1. The entire system shall operate on 24 VDC, filtered switch mode power supply with the rated current available of 9 Amps. The FACP must have a battery charging circuit capable of complying with either of the following requirement:
 - a. Sixty (60) hours of battery standby with five (5) minutes of alarm signaling at the end of this sixty (60) hour period (as required per NFPA 72 remote station signaling requirements) using rechargeable batteries with automatic charger to maintain standby gel-cell batteries in a fully charged condition.
 - b. Twenty-four (24) hours of battery standby with five (5) minutes of alarm signaling at the end of this twenty-four (24) hour period (as required per NFPA 72 central station

signaling requirements) using rechargeable batteries with automatic charger to maintain gel-cell batteries in a fully charged condition.

2. The power supply shall comply with U.L. Standard 864 for power limiting.
3. The FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A "Battery Test" will be performed automatically every minute to check the integrity of the batteries. The test must disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.
4. In the event that it is necessary to provide additional power one or more of the model 5495, 5499 or 5496 Distributed Power Modules shall be used to accomplish this purpose.

G. Connectors and Circuits

1. Connections to the light and power service shall be on a dedicated branch circuit in accordance with the National Fire Alarm Code NFPA 72, National Electrical Code (NEC) NFPA 70, and the local authority having jurisdiction (AHJ). The circuit and connections shall be mechanically protected.
2. A circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL".

H. Accessory Components

1. The FACP shall support the following devices on the RS-485 data bus:
 - a. 6815 Signaling Line Circuit Expander (SLC) Module
 - b. 5824 Printer Interface Module
 - c. RA-2000 LCD Remote Annunciator
 - d. 5865-3 LED Remote Annunciator
 - e. 5865-4 LED Remote Annunciator with reset and silence switches
 - f. 5880 LED I/O module
 - g. RPS-1000 Intelligent Distributed Power Module
 - h. 5495 Remote Addressable Power Supply 6.0 Amp
2. The FACP shall support the operation of 159 detectors and 159 addressable module total devices per SLC loop without regard to device type.

I. 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.

J. Provide required basic wiring materials as specified in Division 26 sections. Comply with manufacturer's instructions and recommendations.

K. Horn/Strobes: 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. Wall Mount Mount:
 - a. Indoor- System Sensor L-Series, P2RL, red, wall-mountable, clear lens, 2-wire, horn strobe marked "FIRE". Selectable strobe settings: 15, 30, 75, 95, 110, 135, and 185 cd.
 - b. Outdoor- System Sensor P2RHK a red, two-wire, outdoor horn strobe with selectable high-candela strobe settings of 135, 150, 177 and 185 sound output where required for coverage.
2. Ceiling Mount:

- a. Indoor - System Sensor L-Series, PC2RL, red, ceiling-mountable, clear lens, 2-wire, horn strobe marked "FIRE". Selectable strobe settings: 15, 30, 75, 95, 115, 150 and 177 cd.
- L. Strobes: Provide manufacturer's standard construction fire alarm strobe, 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. Strobes: Provide manufacturer's standard construction fire alarm strobe, System Sensor L-Series. UL listed to Standard 1971. . Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
 - a. Ceiling Mount:
 - 1) Indoor - System Sensor L-Series Strobe SCWL, Dual voltage (25/70.7 Vrms) with candela setting as required for coverage.
 - b. Wall Mount:
 - 1) Indoor - System Sensor L-Series Strobe SRL, red, wall-mounted, clear lens, strobe marked "FIRE". Selectable strobe settings: 15, 30, 75, 95, 110, 135, and 185 cd..
 - 2. The maximum pulse duration shall be 2/10 of one second.
 - 3. Strobe intensity shall meet the requirements of UL 1971.
 - 4. The flash rate shall meet the requirements of UL 1971.
- M. 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).
- N. Addressable Pull Box (Pull station): Provide manufacturer's standard construction, red enclosure, manual fire alarm stations, double action semi flush mounting, Silent Knight SK-PULL-DA, 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 pull station 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.
- O. Intelligent Photoelectric Smoke Detector: Provide manufacturer's standard construction automatic photoelectric type smoke detector, Silent Knight SK Protocol type with base, SK-PHOTO-W.
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.
- P. 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, SK Protocol type with base, SK-HEAT-W.
- Q. Intelligent Duct Smoke Detector: (Duct Detector) Provide manufacturer's standard construction automatic smoke detectors, duct type, with sampling tubes, Silent Knight SK Protocol type, SK-DUCT with SK-PHOTO-W smoke detector and housing, 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. Duct detectors located above ceiling level shall have device labeled alarm LED test/reset switch in ceiling below detector and clearly readable from floor level. Provide with manufacturers optional accessory remote test/reset for ceiling mount.
 3. 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.
- R. 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 SK-MONITOR or SK-MINIMION.
 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.

S. 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 SK-CONTROL.
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.

T. 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 SK-ISO.
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.

U. Cable

1. All cable shall be color red.

V. System Record Document Cabinet

1. 1. Provide wall mounted Fire Alarm record document cabinet, (1) per campus, exact location to verified with owner prior to installation. Cabinet to be constructed of 16ga. Steel, with a solid piano hinge for the door, and key lock. Provide with 4GB USB flash drive (or adequate size required for storage of all related documents, and software) equal to SRD ACE-11, by Space Age Electronics. Provide with custom project lettering with the campus name, and lock keyed to the fire alarm control panel.

2.04 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

3.01 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 lights and speakers 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. Provide and install new duct detectors in air handling equipment. Fire Alarm contractor will need to coordinate with the mechanical contractor for final tie-in and set-up.

3.02 CONNECTIONS

- A. The Contractor shall make provisions for and shall connect initiating devices to the Fire Alarm System which may be furnished under other sections of these specifications, whether specifically indicated on the Electrical Series drawings or not. This Contractor shall furnish wiring, make final connections to auxiliary devices furnished under other sections of the specifications, and provide interface devices such as relays where required, some of these components may be outside buildings:
 - 1. Door Hold Open devices.
 - 2. Fire Door release devices.
 - 3. Duct detectors.
 - 4. Kitchen hood fire extinguishing equipment.
 - 5. Other dry or wet sprinkler system initiating devices.
- B. 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.
- C. 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.
- D. 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.

3.03 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.

3.04 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.

3.05 FINAL INSPECTION:

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.06 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."

3.07 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 28 3110

FIRE DETECTION AND ALARM - EXPANSION OF EXISTING SYSTEMS

PART 1 - GENERAL

1.01 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 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. These buildings include;**
 - 1. **J.R. Irvin Elementary School: – Renovations throughout the existing building. Confirm scope with architects plans.**
 - 2. **Laura Jenkins Development Center, Warehouse Addition: – [VERIFY].**
- D. Provide Surge Protection Devices (SPDs) / TVSS surge suppression as required by NFPA 72 for all underground circuits.
- E. 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.
 - 10. Provide integrated dialer for outside monitoring of facility.
 - 11. Interface to Kitchen Hood Fire Extinguishing System.
 - 12. Interface to Fire Doors and associated release mechanisms.
 - 13. Door Hold Open devices and release mechanisms.
 - 14. Provide integrated UDAC for Outside Monitoring to transmit system status Monitoring Service.
- F. System shall consist of the following components or their functional equivalents:
 - 1. Microprocessor based central processing unit.
 - 2. Remote Annunciator Panels. (quantity as indicated on plans)
 - 3. Annunciator.
 - 4. Automatic detecting devices.

5. Manual devices.
 6. Alarm and warning devices.
- G. Fire alarm system shall be expandable by the addition of the required modules to the basic system.
- H. Each zone shall consist of not more than eight manual or automatic devices.
- I. 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.
- J. 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.
- K. At the time of Bidding, provide unit cost for owner directed changes for the following devices:
1. Smoke Detectors
 2. Audio / Visual Devices
 3. Visual Only Devices
 4. Duct Detectors
 5. Pull Stations
- 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. **System to be designed in accordance with all applicable codes including local ordinances, by an experienced and licensed Fire Alarm designer.**
- O. 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.
- P. Designer to bid and anticipate providing required devices for existing portable buildings.
- Q. **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.**
- R. 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.

- S. The Fire Alarm Installation Contractor shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications. **The installing contractor is responsible for meeting all required local and national codes.**
- T. **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, etc:**
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.
 4. Fire Alarm Control Panel location – reference plans for location and coordinate exact location with the Architect/Fire Marshal prior to installation.
 5. Kitchen – Heat detectors at a fixed temperature rating
 6. **Provide in writing any deviations from the above, both exclusion recommendations and additions, for review during submittal. Exclusions are to be reviewed and considered by the owner and design team, but not guaranteed. Possible additions required by code to accommodate the above guidelines are to be included in the base bid. Minimum standards above are to be included in the design base bid, exclusions to be considered with a credit value.**
- U. This section of the specification includes the final design, 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 specified herein. The extent of fire alarm system work required is 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.
 2. Services for Monitoring by Eagle Mountain-Saginaw ISD.
- V. The contractor shall be an authorized provider and installer of the specified equipment, and shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications.
- W. The contractor shall utilize all existing current campus building and room identification for programming of fire alarm zones. Devices shall be labeled with building names and either room names, numbers or both as directed by the owner.

- X. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.
- Y. Provide for the design and installation of the fire alarm system, 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.
- Z. **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.
- AA. Provide TVSS surge suppression as required by NFPA 72 for all underground circuits.
- BB. 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 Underwriters 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.
 - 10. Provide integrated dialer for outside monitoring of facility.
 - 11. Interface to Kitchen Hood Fire Extinguishing System.
 - 12. Interface to Fire Doors and associated release mechanisms.
 - 13. Door Hold Open devices and release mechanisms.
 - 14. **Provide integrated IP Fire Alarm Communicator, UL Listed for monitoring**
 - 15. Provide integrated UDAC for Outside Monitoring to transmit system status Monitoring Service, by local telephone lines.
- CC. System shall consist of the following components or their functional equivalents:
 - 1. Microprocessor based central processing unit.
 - 2. Remote Annunciator Panels. (quantity as required by Local Authority Having Jurisdiction, and located with Owner's rep.)
 - 3. Annunciator.
 - 4. Automatic detecting devices.
 - 5. Manual devices.
 - 6. Alarm and warning devices.
- DD. Fire alarm system shall be expandable by the addition of the required modules to the basic system.
- EE. Each zone shall consist of not more than eight manual or automatic devices.

- FF. 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.
- GG. 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.
- HH. An intelligent reporting, microprocessor controlled fire detection and emergency alarm communication system shall be installed in accordance with the specifications, and all applicable codes.
- II. The system shall be designed such that each signaling line circuit (SLC) shall be limited to only 80% of its total capacity used during the initial installation.
- JJ. The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).
- KK. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.
- LL. Coordinate with District for availability, provision and set up of monitoring telephone lines.

1.02 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.

1.03 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.

1.04 QUALITY ASSURANCE

- A. Contractor must be a current, certified dealer/installer of the existing Fire Alarm system.
 1. High School:
 - a. Existing System: Farenhyte – IFP-1000ECS.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.

G. 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.

H. 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.

I. 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.

1.05 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

2.01 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.

2.02 MAIN FIRE ALARM CONTROL PANEL AND FIRE COMMAND CENTER:

- A. Existing to be Relocated.
- B. 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.
- C. Provide required basic wiring materials as specified in Division 26 sections. Comply with manufacturer's instructions and recommendations.
- D. 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.
- E. 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.
- F. 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.

G. 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).

H. 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.

- I. 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.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. 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.

O. 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.

P. Cable

1. **All cable shall be color red.**

2.03 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

3.01 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. Provide and install new duct detectors in existing air handling equipment. Fire Alarm contractor will need to provide a mechanical contractor for final tie-in and set-up.

3.02 CONNECTIONS

- A. The Contractor shall make provisions for and shall connect initiating devices to the Fire Alarm System which may be furnished under other sections of these specifications, whether specifically indicated on the Electrical Series drawings or not. This Contractor shall furnish wiring, make final connections to auxiliary devices furnished under other sections of the specifications, and provide interface devices such as relays where required, some of these components may be existing in existing buildings:
1. Door Hold Open devices.
 2. Fire Door release devices.
 3. Duct detectors.
 4. Kitchen hood fire extinguishing equipment.
 5. Other dry or wet sprinkler system initiating devices.
 6. Dry Contacts for and connection to District's Monitoring Interface.
- B. 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.
- C. 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.
- D. 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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."

3.07 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 0000

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 4529 - Testing Agency Services
 - 2. Section 31 1000 - 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 3323 - 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 4529 - TESTING AGENCY 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 Sheet piling: Shore and sheet excavations to protect utilities and to prevent cave-in. Maintain sheet piling secure until permanent construction is in place. Remove sheet piling 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 12", and stockpile for placement 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.
 - 2. Refer to landscape architect plans and specifications for additional topsoil requirements.

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 of -2 to +4 percentage points of the soil's optimum moisture content.
- J. Scarify general subgrade soils in place to a depth of 6 inches and compact to at least 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content of -2 to +5 percentage points of 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 6" 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 recompact.

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 and compaction per Geotechnical Report. 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.
 - 6. 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.
 - 3. Bring backfill to required grades by depositing material in horizontal layers not more than 8" 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 of -2 to +4 percentage points of the soil's optimum moisture content. Scarify general subgrade soils in place to a depth of 6 inches and compact to at least 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content of -2 to +5 percentage points of 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-----95-100%
 - c. Material under building-----Per Geotechnical Report

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 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.
 - 4. The cost of the full-time inspection service shall be per Specification SECTION 01 4529 - TESTING AGENCY 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 1000

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 0000 - Earthwork.

1.03 PROJECT CONDITIONS

- A. Existing Conditions: Site is an existing school building with associated parking and site improvements. 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 1100 - 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.
- B. 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.

END OF SECTION

SECTION 31 2310
BUILDING EXCAVATION AND FILL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work included: Excavate, backfill, compact, and grade for the building to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 00 3132 – Geotechnical Data.
 - 3. Section 01 4000 – Quality Requirements.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the Geotechnical Engineer.

1.03 PRODUCT HANDLING

- A. Comply with pertinent provisions of Supplementary Conditions.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

- A. Provide fill as indicated on the Drawing Sheets prepared by the various design professionals on the project.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISH ELEVATIONS AND LINES

- A. Finish grades shall be as shown on the site plan and shall form straight lines of slope between elevation markings.

3.03 PROCEDURES

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
 - 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
 - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.
- B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. De-watering:
1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
 2. Keep excavations and site construction area free from water.
 3. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- D. Maintain access to adjacent areas at all times.
- 3.04 **EXCAVATING**
- A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.
- B. Surplus material:
1. Dispose of unsatisfactory excavated material, and surplus satisfactory excavated material, away from the Project site.
- C. Unauthorized excavation:
1. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific instruction from the Architect or the Geotechnical Engineer.
 2. Under footings, foundations, or retaining walls:
 - a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
 - b. When acceptable to the Geotechnical Engineer, lean concrete fill may be used to bring the bottom elevation to proper position.
 3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Geotechnical Engineer.
- D. Stability of excavations:
1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the Geotechnical Engineer.
 2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
 3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- E. Shoring and bracing:
1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.
 2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.
 3. Carry shoring and bracing down as excavation progresses.
- F. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft., and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required, and for inspection.
 2. In excavating for footings and foundations, take care not to disturb bottom of excavation:
 - a. Excavate by hand tools to final grade just before concrete is placed.

- b. Trim bottoms to required lines and grades to leave solid base to receive concrete.
- c. Where continuous or spot footings are shown to be bearing on the soil, compact the bottom of the footing as noted in Paragraph 3.06 of this Section. Trenches and foundation holes shall be dry and free of water when concrete is placed.
- 3. Excavate for footings and foundations only after general site excavating, filling, and grading are complete.

3.05 FILLING AND BACKFILLING

- A. General:
 - 1. For each classification listed below, place acceptable soil material in layers to required sub-grade elevations. Provide fill and backfill as indicated on the Drawing Sheets prepared by the various design professionals on the project.
- B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following.
 - 1. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
 - 2. Inspecting, testing, approving, and recording locations of underground utilities.
 - 3. Removing concrete formwork.
 - 4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
 - 5. Removing trash and debris.
 - 6. Placement of horizontal bracing on horizontally supported walls.
- C. Placing and compacting:
 - 1. Place backfill and fill materials in layers not more than 8" in loose depth.
 - 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
 - 3. Compact each layer to required percentage of maximum density for area.
 - 4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
 - 5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
 - 6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
 - 7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.06 COMPACTING

- A. Compact the soil within the building lines as indicated in the Structural drawings and the geotechnical report. If there are any discrepancies, the Contractor shall compact to the most stringent case of these.
- B. Control soil compaction during construction outside building lines to provide the minimum percentage of density specified for each area as determined according to ASTM D698 Standard Proctor Density.

3.07 FIELD QUALITY CONTROL

- A. An Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Section 01 4533.

3.08 MAINTENANCE

- A. Protect newly graded areas.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

PART 4 – TRENCHING REQUIREMENTS

4.01 GENERAL

- A. These requirements shall be used for all trench excavations deeper than five (5) feet. The excavating and trenching operation manual of OSHA, Subpart B (latest edition) shall be the minimum governing requirement of this item and is hereby made a part of this specification.
1. Banks more than 5 feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table P-1 as a guide sloping of banks. Trenches less than 5 feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.
 2. Sides of trenches in unstable or soft material, 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Table P-1, P-2 (following paragraph (I) of this section.)
 3. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level may be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.
 4. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
 5. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.
 6. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.
 7. Minimum requirements for trench timbering shall be in accordance with Table P-2.
 8. Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:
 - a. $S=3-20L/D$
 - b. Maximum ratio $L/D=50$
 - c. Where: L = Length, unsupported, in inches.
 - d. D = Least side of the timber in inches.
 - e. S = Allowable stress in pounds per square inch of cross-section.
 9. When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25 feet of lateral travel.
 10. Bracing or shoring of trenches shall be carried along with the excavation.
 11. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.
 12. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide

- protection equal to or greater than the sheeting or shoring required for the trench.
13. Backfilling and removal of trench supports shall progress together from the bottom of the trench.
 14. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.
- B. Definitions applicable to this subpart:
1. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.
 2. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.
 3. "Bank" - A mass of soil rising above a digging level.
 4. "Belled excavation" - A part of a shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.
 5. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.
 6. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
 7. "Faces" - See paragraph (k) of this section.
 8. "Hard compact soil" - All earth materials not classified as running or unstable.
 9. "Kickouts" - Accidental release or failure of a shore or brace.
 10. "Sheet pile" - A pile, or sheeting, that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
 11. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.
 12. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
 13. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.
 14. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
 15. "Trench jack" - Screw or hydraulic type jacks used as cross bracing in a trench shoring system.
 16. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.
 17. "Unstable soil" - Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.
 18. "Uprights" - The vertical members of a shoring system.
 19. "Wales" - See paragraph (m) of this section.
 20. "Walls" - See paragraph (k) of this section.

END OF SECTION

SECTION 31 2333

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 1000 – Site Clearing
 - 2. Section 31 0000 – Earthwork
 - 3. Section 33 1000 – Water Utilities
 - 4. Section 33 3000 – Sanitary Sewerage Utilities
 - 5. Section 33 4000 – 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 RCP/HDPE storm sewers shall be as specified in Section 501.6, 504 and 504.2.1 thru 504.2.3 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. Backfill trenches per Geotechnical Report.
 - 2. Carefully deposit in uniform layers, not to exceed six (6") inches thick.
 - 3. Compact each layer by rolling, ramming and tamping with tools suitable for that purpose in such a manner so as to not disturb the pipe.
 - 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 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act 2006.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.
- E. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- F. Manufacturer's Application Instructions: Indicate caution requirements and materials list of proposed items to be provided under this section.
- G. Record and document moisture content of soil before application, date and rate of application, areas of application, and diary of toxicity meter readings and corresponding soil coverage.
- H. Installer Qualifications: Company specializing in performing work of the type specified and with minimum 5 years years of documented experience.
- I. Maintenance Data: Indicate re-treatment schedule .
- J. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of 5 years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in Texas.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused by termites.
 - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
 - 2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.
 - 3. Make inspections, retreatment, and repairs at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

- A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.
- C. Manufacturers:
 - 1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management.
 - 2. FMC Professional Solutions: www.fmcprosolutions.com.
 - 3. Syngenta Professional Products: www.syngentaprofessionalproducts.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- D. Mixes: Mix toxicant to manufacturer's instructions.
- E. If combinations of toxicants are approved by governmental agencies having jurisdiction, provide toxicants having such approval and in the maximum strength so approved, at no additional cost to the Owner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. In Crawl Spaces.
 - 3. At Both Sides of Foundation Surface.
 - 4. Utility Entrances
 - 5. Immediately below expansion joints, control joints, and all areas where slab will be penetrated by construction features.
 - 6. Where exterior facings or veneers extend below grade level along the exterior side of all foundation walls.
 - 7. Where unit masonry foundation construction is used.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier or void forms.
- E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
- F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- G. Re-treat disturbed treated soil with same toxicant as original treatment.
- H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

- A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 31 3200

SOIL STABILIZATION

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: In-place lime treatment to stabilize the subgrade under concrete and asphaltic concrete pavement, and concrete walks, which parallel drives.
- B. Related Sections:
 - 1. Section 01 4529 – Testing Agency Services.
 - 2. Section 31 0000 – Earthwork.
 - 3. Section 32 1313 – Concrete Paving

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 698-91 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³).
- B. Geotechnical Report
- C. TxDOT - Standard Specifications for Construction of Highways, Streets and Bridges, Texas Dept. of Highways and Public Transportation, as amended.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lime Stabilization for Paving Subgrade
 - 1. Hydrated Lime: Type A (slurry): Per TxDOT Item 260 & 264.
- B. Soil: Upper 6" of the material in-place after the subgrade has been established, compacted, and shaped.
- C. Lime: Hydrated lime made from "high-calcium" type limestone with an unhydrated lime content a minimum of 7% by weight at 32 lbs per SY and a "free" water content not exceeding 4% by weight. Waste lime will not be acceptable.

2.02 EQUIPMENT

- A. Distributor truck or tank equipped with agitator to maintain a uniform mixture of lime and water.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Insure that surfaces have been brought to approximate rough grades (plus or minus 0.10 feet). Loosen and pulverize soil to a depth of 6 inches below bottom of designated paving or slab areas, including a distance of 24" outside perimeter of paving and 12" past sidewalk per the plans.

3.02 PERFORMANCE - PAVING SUBGRADE

- A. General: It is the primary requirement to secure a completed 6" deep subgrade of treated material containing a uniform lime mixture, free of loose areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent paving and slabs to achieve a soils Plasticity Index of not greater than 12. Construction methods and equipment shall comply to TxDOT Item 260 & 264 for Type A treatment.
- B. Scarification: Excavate and scarify the material to be treated down to the secondary grade (proposed bottom of lime treatment). Wet or unstable material below the secondary grade shall be corrected by scarifying, adding lime and compacting to uniform stability. Then spread the excavated and scarified material to the desired cross-section. Full depth of treatment shall be 6 inches and full width shall be the entire area to be paved between points and lines located a minimum of 12" beyond pavement edges and 24" beyond sidewalk edge or per the plans, whichever is greater.
- C. Placing Lime: Add lime to the scarified material in an amount equal to 32 lbs. per sq. yd. of 6" depth of compacted subgrade or as otherwise required to reduce plasticity index to 12 or less per ASTM D421. Apply lime mixed with water to form a slurry. Spread lime only on that area where mixing operations can be completed during the same working day.
- D. Mixing: Mix the soil and lime thoroughly with suitable road mixers or other approved equipment until a homogeneous, friable mixture is obtained free from clods and lumps. Aerate or sprinkle the mixture as necessary to secure the optimum moisture content. Necessary optimum moisture content shall be the range of moisture between optimum and +4 percent greater than optimum.
- E. Curing: Allow the mixture to cure for a period of from 48 to 72 hours. During the curing period keep the material moist. During this time, the section shall not be opened to vehicular traffic.
- F. Final Mixing: After the required curing time, mix the material uniformly with a rotary mixer to reduce the size of the particles so that 100% will pass a 1-3/4" sieve and 60% will pass a No. 4 sieve. Lime-soil mixture pH shall be 12.4 or greater. If not possible to attain 12.4, maximum pH attainable shall be validated by laboratory test for soil being treated.
- G. Compacting: Sprinkle the mixture as required and compact by rolling and tamping to a minimum of 95% standard density, ASTM D 698, and at a moisture content between optimum and +4 percent. Correct irregularities and weak spots by scarifying, adding or removing material, and re-shaping and re-compacting. Maintain the surface of the subgrade smooth, free from undulations and ruts, and to the established lines and grades.

3.03 FIELD QUALITY CONTROL

- A. Compaction Tests: Field density testing of the completed stabilized subgrade under paving shall be performed by an Independent Testing Laboratory.
 - 1. The Laboratory shall make one density test for each 5000 sq. ft. of stabilized subgrade to insure that the specified density is obtained.

END OF SECTION

SECTION 31 6329
DRILLED CONCRETE PIERS AND SHAFTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Machine drilled shaft and belled base.
- B. Concrete and reinforcement.
- C. Shaft liner, if required.

1.02 RELATED REQUIREMENTS

- A. Section 01 1400 - Work Restrictions
- B. Section 01 4000 - Contractor's Quality Assurance
- C. Section 01 4533 - Code-Required Quality Control
- D. Section 03 2000 - Concrete Reinforcing: Requirements for concrete reinforcement.
- E. Section 03 3000 - Cast-in-Place Concrete: Requirements for concrete.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Proposers shall assume all drilled piers shall be installed as shown on the construction documents as part of the construction, with adjustments made by unit price. The same unit price shall be used for adding linear feet as is used for deducting linear feet. If more than one unit price is submitted for each type, (e.g. if a different price is submitted for adding than for deducting), the average of the absolute values shall be used for adding and deducting.
Proposers shall provide a unit price for each type of pier, \$/LF, with the Proposal. If a unit price is not provided with the Proposal and made part of the Agreement with the Owner, the Contractor shall not begin installation of drilled piers until a unit price is proposed and the Owner agrees to the unit price. If a unit price is not agreed to by the Owner before drilled piers begin, the Architect will establish a unit price that the Architect believes to be fair and reasonable, based solely on the Architect's opinion, to make any cost adjustments if the actual piers vary from the designed piers. The Proposal and Unit Prices shall include costs of mobilizing equipment. For example, if equipment needs to be remobilized to drill piers at the end of the project, the Owner shall not be responsible for the costs of remobilization.
- B. Designed Piers:
 - 1. Design Pier Quantity: Determined by the quantity of piers indicated in the Contract Documents. Refer to Typical Details and Plans. The Plans may not show all piers required by the typical details at, for example, site structures such as fences.
 - 2. Design Pier Length: By the linear foot measured from bottom of pier to top of pier elevation as indicated.
 - 3. Pier Casings: By the linear foot. For proposal purposes, Proposers shall assume that 0% of the drilled piers will require casing.
- C. Actual Piers:
 - 1. Actual Pier Quantity: Determined by quantity of piers identified in the Project Record Documents.
 - 2. Actual Pier Length: Determined by length of piers identified in Project Record Documents.
 - 3. Pier Casings: By the linear foot. The actual cased length shall be defined from the top of the pier to the bottom of the casing. Any pier penetration below the bottom of the casing shall be considered uncased pier length.
- D. Adjustments to the Contract Sum/Price will be made if the Actual Pier Quantity or Length differs from Design Pier Quantity or Length, based on unit prices established in the Agreement and as follows:
 - 1. Unit price per unit length. To calculate cost adjustment, multiply unit price by difference between the sum of the total Design Pier Lengths for all piers of each type on the project and Actual Pier Lengths for all piers of each type on the project.

2. The Contractor shall not be compensated for penetrations deeper than indicated to be required by the Owner's Testing Laboratory
 - E. Determination of Unit Measurements: Identified by site measurements and verified by Owner's testing laboratory. The Contractor shall notify the Laboratory when the last pier has been drilled and request a report from the Laboratory to assist with the calculation of cost adjustment. The Laboratory shall determine the difference between the sum of the total Design Pier Lengths for all piers of each type on the project and Actual Pier Lengths for all piers of each type on the project
- 1.04 REFERENCE STANDARDS**
- A. ACI 336.1 - Specification for the Construction of Drilled Piers 2001.
 - B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
 - C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
 - D. ASTM A929/A929M - Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe 2018.
- 1.05 ADMINISTRATIVE REQUIREMENTS**
- A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.
- 1.06 SUBMITTALS**
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
 - B. Shop Drawings:
 1. Pier Diameter
 2. Anticipated length
 3. Pier reinforcement
 4. Top of pier elevations
 - C. Project Record Documents: Record actual locations of piers, pier diameter, and pier length. Accurately record the following:
 1. Sizes, lengths, and locations of piers.
 2. Sequence of placement.
 3. Final base and top elevations.
 4. Deviation from indicated locations.
 5. Placement and configuration of reinforcement deviations.
- 1.07 QUALITY ASSURANCE**
- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Casing: Temporary casings of steel conforming to ASTM A 36 of sufficient strength to withstand handling and drilling stresses, concrete pressures, and surrounding earth and water pressures.
- B. Concrete Materials and Mix: Specified in Section 03 3000.
- C. Reinforcement: Specified in Section 03 2000; spiral wound. Spiral bars shall be smooth rod spiral, not deformed rebar. Vertical pier reinforcement shall not be spliced. Vertical bars shall be shipped to the project in stock lengths and field cut after measuring each pier.
- D. Equipment: Appropriate for dewatering excavated shaft.
- E. Reinforcement Supports:
 1. Manufacturers
 - a. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
 - b. Pier Sleds and Bolsters:

- 1) Pierresearch, 501 East Main Street, Arlington, TX, 800-342-2409, www.pierresearch.com.
 - 2) Foundation Technologies, Inc., Tucker, GA, www.foundationtechnologies.com.
 - 3) Blackthorn, Inc., 6113 Brookville Sale Road, Clayton, OH, www.blackthorn-inc.com.
 - 4) EZ-Lok Products by Dayton Superior, 1002 Avenue T, Grand Prairie, TX, 800-745-3703, www.daytonsuperior.com.
 - 5) Substitutions under provisions of Section 01 6000 - Product Requirements.
2. Pier Sled or Wheel Spacers
- a. Pier sleds shall be fabricated concrete support with minimum compressive strength of 8,500 psi and integral wire ties.
 - b. Wire ties: plain finish.
 - 1) Manufactured sizes:
 - (a) Nominal 8 x 3 x 1-1/4 inch
 - (b) Nominal 8 x 4 x 1-1/4 inch
 - (c) Use 3-inch sled for uncased and 4-inch sled for cased piers.
 - c. Wheel spacers shall be EZ-LOK - PLW-300/4-HD, 3/4-inch thick.
 - d. Provide minimum three sleds or wheels around the cage at 10'-0" maximum on center spaced uniformly to properly align cage in shaft.
3. Pier Bolster
- a. Fabricated concrete support with minimum compressive strength of 8,500 psi and integral wire ties.
 - 1) Wire ties: plain finish.
 - 2) Manufactured size: nominal 4-inch diameter by 3-inch high with two 9-gage wires for attachment to bottom of reinforcing cage.
 - b. Minimum number of bolsters per cage, spaced to support steel free of earth:

Diameter in Inches	Under 30"	30" to 48"	49" to 72"
Number of Pier Bolsters per Pier Shaft	2	4	6

PART 3 EXECUTION

3.01 PREPARATION

- A. Use placement method which will not cause damage to nearby structures.
- B. Notify adjacent and affected land owners and building occupants before proceeding with the work.
- C. Protect structures near the work from damage.
- D. Prepare to place piers from excavated working elevation.
- E. Grade perimeter of pier and shaft area to prevent surface water from draining into soil borings. Provide temporary means and methods, as required, to maintain surface diversion until no longer needed, or as directed by the Architect.
- F. Test Pier Holes: (The paragraphs below shall not apply to light pole bases.)
 1. The Contractor shall drill all Test Pier Holes (belling and/or dewatering if required) as indicated on the Structural Drawings in the presence of the Special Inspection and Testing Agency (SITA). If none are shown on the Structural Drawings, the Contractor shall drill one Test Pier Hole (to the diameter and depth required for a type "A" pier, belling if required for a type "A" pier) for every 50,000 square feet of floor plan within the building area with the location(s) to be determined by the SITA.

2. Within one (1) business day after receiving the Test Pier Hole Report from the SITA, the Contractor shall forward the report to the Structural Engineer with a Request for Information (RFI), requesting verification that the conditions encountered are generally consistent with those required for proposal purposes (total lineal feet of cased and uncased piers). If conditions are significantly different from what was anticipated, the Structural Engineer may recommend modification of the pier design(s).

3.02 INSTALLATION

- A. Refer to Section 01 1400 for work restrictions regarding the schedule of drilled pier installation.
- B. Construct piers in accordance with ACI 336.1.
- C. Drill vertical pier shafts to diameters and depths indicated.
- D. Place steel casings during drilling operations. Set firmly in place. If casing is to be temporary, install shaft liner with sufficient strength to withstand concrete pressures.
 1. Withdrawal of temporary casings is at option of Contractor.
- E. Clean shaft and bottom of loose material. Provide temporary means and methods, as required, to remove all water from soil borings as needed, or until directed by the Geotechnical Engineer.
- F. Allow inspection of shaft prior to placement of reinforcement and concrete.
- G. Place reinforcing steel in accordance with Section 03 2000.
- H. Fabrication and Placing of Reinforcing
 1. All steel reinforcing cages shall be completely fabricated in a rigid fashion in order to permit expeditious placement into the shaft excavation by service equipment with a minimum time delay.
 2. The reinforcing steel cage for the shafts, consisting of longitudinal bars and hoops or ties, shall be completely assembled and placed into the shaft as a unit. Each longitudinal bar shall be tied to each hoop or tie.
 3. Place pier bottom bolsters in accordance with manufacturer's recommendations.
 4. Place pier side sleds in accordance with manufacturer's recommendations.
- I. Place concrete in single pour, in accordance with Section 03 3000 with equipment designed for vertical placement of concrete.
- J. Placing of Concrete
 1. Concrete may be placed through a tremie if desired by the Contractor if concrete will not strike the side of the shaft.
 2. Concrete shall be placed as soon as practical after the pier excavation has been completed and in no case shall the time lapse between completion of the excavations and concrete placement therein exceed four (4) hours (no pier excavation shall be left open overnight).
 3. Placement of concrete in any individual shaft shall be continuous from the beginning of concrete placement to the completion of any individual shaft installation. Concrete shall be vibrated.
- K. Coordinate casing withdrawal with concrete placement so that concrete pressure head exceeds anticipated outside soil and water pressure above bottom of casing at all times during withdrawal. Vibration and rotation will not be permitted during extraction of the casing and special care shall be exercised to insure that separation or squeezing of the freshly placed concrete does not occur. At all times during extraction of the casing, the concrete head within the casing shall be sufficient to prevent encroachment of ground water or caving material into the freshly placed concrete.
- L. Extend reinforcement or provide dowels for connection of caps and grade beams.
- M. Set tops of piers to elevations indicated.

3.03 TOLERANCES

- A. Install piers with maximum variation from location, plumbness, bottom area, diameter, and anchorage locations as specified in ACI 336.1.

- B. Maximum Variation From Vertical: 1 in 48.
- C. Maximum Variation From Design Top Elevation: Plus 3 inches, minus 1 inch.
- D. Maximum Out-of-Position: 2 inches.

3.04 FIELD QUALITY CONTROL

- A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.05 UNACCEPTABLE PIERS

- A. Unacceptable Piers: Piers that fail, are placed out of position, are below elevations, or are damaged.
- B. Provide additional piers or replace piers failing to conform to specified requirements.

END OF SECTION

SECTION 32 1313

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 0000 - 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 3323 - 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 3323 - 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 3/4 of the minimum clear spacing between reinforcing bars.
- E. Admixture: ASTM C 494, Types "A", "D" and "E", water reducing, chloride-free admixture.
- F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- 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 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 flatwork. (Entrained Air: 4-6%, 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 1100 for additional installation requirements.
 - 1. Walks: 4" and 5" 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 (Parking Areas)
 - b. 6" thick – Medium-Duty Parking Areas (Drives, Bus Lanes 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 with 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. **Concrete shall be placed using a walk behind screed machine (Magic Screed). In addition, a backpack vibrator shall be used. A minimum of two (2) screed machines and backpack vibrators shall be present during all concrete pours.** 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 anytime 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 1/2" 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 5000 – 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 1723

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 1313 - 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 6000 - PRODUCT REQUIREMENTS.

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 1900

WALK, ROAD, AND PARKING APPURTENANCES

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 WORK INCLUDED

- B. Provide and install handicapped parking signs and traffic directional signs.

1.03 REFERENCES

- A.. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 591 Steel Sheet, Cold-Rolled, Electrolytic Zinc- Coated.
 - 2. ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM C 33 Concrete Aggregates
 - 4. ASTM C 150 Portland Cement
- B. Military Specifications (Mil. Spec.):
 - 1. Mil. Spec. MIL-R-13689A

1.04 SUBMITTALS

- A. Product Data: Submit in accordance with SECTION 01 3323 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include catalog, cuts of each type of sign and manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle signs in accordance with SECTION 01 6000 – PRODUCT REQUIREMENTS and in manufacturer's cartons. Store off ground on planking. Cover with non-staining plastic.

1.06 PROJECT CONDITIONS

- A. Coordinate installation of signs with work of other trades.
- B. Location of signs shall be in accordance with City and State requirements. Signs shall be positioned not to conflict with automobile or pedestrian traffic.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Site signs: As manufactured by Sa-So (Sargent-Sowell, Inc.) 1185 108th Street, Grand Prairie, Texas 75050 (phone 647-1525), or approved equivalent.

2.02 MATERIALS

- A. Sign Materials: Aluminum Sheets: ASTM B 209, alloy 6061 T6, degreased and etched, 0.080" thickness. Sign faces shall be fully reflectorized with material conforming to Mil. Spec. MIL-R-13689A.
- B. Bolts, Nuts, Washers, and Clamps: Cadmium or galvanized steel. Bolts shall be a minimum of 5/16" in diameter. Clamps shall be two-piece assemblies of at least 14-gage steel or shall be an adjustable steel strap bracket.
- C. Posts: Standard galvanized steel pipe 2-3/8" in diameter and weighing not less than 2 lbs. per linear foot.
- D. Concrete: Provide concrete consisting of Portland cement (ASTM C 150), aggregates (ASTM C 33), and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi, using at least 4 sacks of cement per cubic yard, 1 inch maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

2.03 SITE SIGNS

- A. General: Site signs shall be of the quality manufactured by Sa-So and are listed by Sa-So catalog numbers for convenience in identification.
- B. Accessible Parking Signs: Reflective .080 Aluminum.
- C. Accessible Loading Zone Sign: Reflective .080 Aluminum.
- D. Traffic Signs:
 - 1. ONE WAY Signs: Reflective sheeting on 0.080" aluminum.
 - 2. ONE WAY - DO NOT ENTER Signs: Reflective sheeting on 0.080" aluminum.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Excavation: Drill holes of the size indicated for posts. Excavate holes to the depths indicated. Remove excess concrete and excavated soil from the site.
- B. Setting Posts:
 - 1. Remove all loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete. Center and align posts in holes.
 - 2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Trowel finish tops of footings, and slope or dome to direct water away from posts.
- C. Attach signs to posts with bolts, washers, nuts and clamps.
- D. Clean exposed sign faces and galvanized surfaces, and leave free of defects. Use no abrasives. Leave pavement and graded area clean and free of debris.

END OF SECTION

SECTION 32 3113

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):
 - 1. 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 Marcellled 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 3323 – 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) galvanized steel 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 $\frac{3}{4}$ " 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 $\frac{3}{8}$ " 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 3000 – Cast-in-Place Concrete.

- Q. Privacy Slats: Equal to Fina/Slat '1000' as manufactured by Master Halco, Inc. Provide top and bottom "U" Channel.

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.
- J. Privacy Slats: Install per manufacturer's recommendation. Provide top and bottom "U" Channel.

END OF SECTION

**SECTION 32 8400
PLANTING IRRIGATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope - Furnish and install an operating irrigation system complete and in place to include pipe, fittings, heads, valves, controller/junction box, pump system, wire and related accessories. The word "Contractor" when used alone shall refer to the irrigation contractor.
- B. Contractor is hereby advised that a PERFORMANCE SPECIFICATION will be in place and that additional equipment, parts and labor shall be furnished as required to provide a proper and satisfactory irrigation system at no additional cost to the Owner.
- C. Adhere to local permit and other requirements. All permits and fees shall be paid by Contractor.
- D. Coordinate installation with other trades as necessary to prevent cutting, patching or re-routing.

1.02 RELATED WORK:

- A. Section 32 9223 – Sodding

1.03 QUALITY ASSURANCE

- A. Materials, Equipment, Installation
Materials, equipment, and installation shall comply with National Fire Protection Association (National Electrical Code), American Society for Testing and Materials, National Sanitation Foundation, Irrigation Association, and all applicable local codes and ordinances. Contractor shall have successfully completed and provide references of a minimum five projects of similar size and scope within the last five years under the same company name.
- B. Licensing
Installation design, pricing and installation shall be made by a contractor licensed as an irrigator by the State of Texas. Skilled workmen shall be used who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.
- C. Existing Features
Prior to beginning construction the contractor shall field locate all utilities and maintain their locations. Existing features designated to remain as part of landscape shall be protected. If the contractor causes any damage to existing conditions to remain, then the contractor shall bear the expense of repair.
- D. Damage to Adjacent Facilities
Damage to adjacent facilities caused by irrigation system work shall be repaired promptly at contractor's expense.
- E. Safety
Contractor shall maintain a safe working environment at all times.
- F. The owner or Architect reserves the right to reject any or all work which does not comply with the plans and specifications. Rejected work shall be brought into compliance by the contractor at no additional cost to the owner.
- G. Applicable Standards
ASTM-D2241-Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
ASTM-D2464-Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 40

ASTM-D2466-Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40
ASTM-D2564-Solvent Cements for Poly Vinyl Chloride (PVC) pipe and fittings
ASTM-D2855-Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

H. Contractor Responsibilities

The contractor shall give all necessary notices, file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Architect before request of acceptance and final payment for work. Permit fees paid by owner, Permits obtained by Contractor.

- I. The contractor shall at all times protect his work from damage and theft and replace all damaged or stolen parts at his expense until the work is accepted in writing by the Owner.

1.04 UNIT PRICES:

Provide unit prices for work and materials. Unit prices will be applied when greater or lesser amount of work is required. Unit prices are to be the cost of work and materials in place including materials, equipment, labor, taxes, overhead, guarantee, maintenance and profit.

1.05 REFERENCES:

ASTM - American Society for Testing Materials
D2241: Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
D2287: Flexible Polyvinyl Chloride (PVC) Plastic Pipe.
D2464: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 80.
D2466: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
D2564: Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.
D2855: Making Solvent - Cemented Joints for Polyvinyl Chloride (PVC) Plastic Pipe Fittings.

1.06 DEFINITIONS:

- A. Irrigation Main: That portion of piping from water source to remote control valves. This portion of piping is subject to surges, being a closed portion of the irrigation system. Hydrant lines (QCV) are considered a part of the main line piping system.
- B. Lateral Piping: That portion of piping from remote control valve to sprinkler heads and tubing.

1.07 SYSTEM DESCRIPTION:

Install to provide a complete coverage for lawn and planting areas within limits shown on Drawings. Furnish and install an operating system complete with electrical connection, main and lateral line piping, sprinkler heads, remote control valves, quick coupler valves, wire and any other items required for a complete and operating system.

1.08 SUBMITTALS:

- A. Product Data: Manufacturer's literature in triplicate, neatly bound with cover titled with name and address of project, date of submission, and name and address of Owner, Landscape Architect and Contractor.
- B. Irrigation Plan: Complete plan showing design water pressure, routing and sizing of piping, head placement, type and nozzle size, valve location and size, zone GPM, controller location and size, backflow preventer location and size, and material list indicating manufacturer and model number for each item. Design of system not to exceed manufacturer's requirements for spacing and GPM. Size piping not to exceed 5 F.P.S.
- C. Project Record Documents:
1. Maintain at site one copy of Drawings, Specifications, Addenda, approved Change Orders and other modifications in good order and marked to record changes made

- during construction.
- 2. Upon completion of work, transpose changes to mylar sepia.
- 3. Return sepia to Owner and Landscape Architect prior to issuance of final acceptance. Sepia to include location, by written dimension, of mainline piping, remote control valves and quick coupler valves. Title sepia "Record Drawing" and include date and signature and license of installer.
- D. Provide three complete operation manuals and equipment brochures neatly bound in a hard back three-ring binder. Include any warranties and guarantees extended to the Contractor by the manufacturer of all equipment. Include three (3) executed copies of "Guarantee for Landscape Irrigation System".

1.09 GUARANTEE

- A. The guarantee for the sprinkler 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 Landscape Architect 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 LANDSCAPE IRRIGATION SYSTEM

We hereby guarantee that the landscape 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 expected. We agree to repair or replace any defects in material or workmanship, which may develop, and 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 replacements 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. We will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

COMPANY: _____

ADDRESS: _____

PHONE: (____) _____ - _____

DATE OF ACCEPTANCE: _____ / _____ / _____

1.10 PROJECT/SITE CONDITIONS:

- A. Water Supply: Provide as indicated on Drawings. Owner will provide water for required testing, flushing and nozzling.
- B. Sleeves and Ducts: Install as indicated on Drawings. Do not use as main nor lateral piping.
- C. Existing Utilities and Structures: Consult with Owner and appropriate utility companies for location prior to commencing installation. Repair damage due to installation immediately. Make necessary adjustments in the layout as may be required to connect to existing stub outs, should such stub outs not be located or describes exactly as shown, and as may be required to work around existing conditions.
- D. Storage: Space will be designated at the site.
- E. Barricades: Barricade streets per local codes and regulations during installation.
- F. Deliver materials in original package, cartons, and containers bearing the name of manufacturer, brand and model number.
- G. Protect irrigation system materials before, during and after installation. Exercise care in handling, loading, unloading, coverings and storing plastic pipe and fittings until ready to install. Handle all material in an approved manner. No damage materials shall be used.
- H. In the event of damage, immediately make repairs and replacements necessary at no additional cost to Owner.

1.11 SCHEDULING:

- A. Coordinate with Landscape Contractor and other work.
- B. Prepare a detailed schedule coordinated with the work of other contractors doing work at the site.
- C. Monitor schedules on a regular basis so potential variances can be determined and resolved.
- D. Verify all product orders so delivers are timed to maintain construction schedules.

1.12 MAINTENANCE:

- A. Provide maintenance of system including cleaning and adjustment of heads, raising and lowering of heads, cleaning filters, flushing lateral lines and tubing for 60 days after final acceptance.
- B. Repair backfill settlement of trenches and re-sod during 60 day period.
- C. Drain and flush system within 60 day guarantee period.
- D. Instruct Owner and Owner's personnel in operation and general maintenance of system. Provide Owner with a maintenance manual of materials installed bound in a three ring black vinyl binder.
- E. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to the work.
- F. Maintain the entire irrigation system in proper workings order and program the controllers in consultation with Landscape Contractor during the installation and maintenance phase of the work prior to final acceptance.
- G. Provide the Owner with a letter summarizing the warranty stated in this specification and date of final acceptance. This letter shall serve as the Contractor's written guarantee.

PART 2 - PRODUCTS

2.01 BACKFLOW PREVENTION UNITS:

- A. Backflow prevention units shall be:
 - 1. If new, of size and type indicated on the drawings. Install backflow prevention units in accordance with irrigation construction code requirements.

2. If existing, recertified as required by State law and municipal code if more than one (1) year in place
 - B. 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.
- 2.02 POLY VINYL CHLORIDE PIPE:
- A. As manufactured in accordance with standards noted herein:
 1. Marking and Identification: Continuously and permanently marked with manufacturer's name, pipe size, pipe type and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) Seal.
 2. Pipe Fittings: Of same material as PVC pipe specified and compatible with PVC pipe furnished.
 3. PVC Pipe: Class 200, SDR 21, except one-half inch to be Class 315, SDR 13.5. Under paved surfaces and in sleeves to be Schedule 40.
 4. Flexible PVC Pipe: Heavy duty flexible vinyl pipe as manufactured by Agricultural Products, Inc.
 5. Sleeves: Class 200, SDR 21.
- 2.03 VALVE WIRING:
- A. All wire shall be a minimum of Type UF, No. 14 gauge with 4/64 inch insulation, Underwriters Laboratory approved for direct underground burial when used in National Electrical Code, Class II circuit (30 volts AC or less) and sized not less than specified by manufacturer. Adjust for larger wire size according to field conditions and length of wire run to controller. Color code wire red for lead wire and white for common wire.
- 2.04 WIRE SPLICES:
- A. "Dri-Splice" as manufactured by Spears Manufacturing Company or "DBY Connectors" as manufactured by 3-M Company.
- 2.05 SOLVENT, CLEANER AND PRIMER:
- A. Conform to ASTM D2564
 - B. PVC Pipe and Fittings: Weld-On #705 Solvent and #P-70 Primer.
 - C. Flexible PVC Pipe to Schedule 40 Fittings: Weld-On #795 Solvent and #P-70 Primer.
- 2.06 QUICK COUPLER VALVES:
- A. Shall be 1" bronze bodied valves with a purple rubber seat and plated cover. Keys shall be bronze constructed with 1" FIP x 1" MIP threaded.
- 2.07 ISOLATION VALVES:
- A. Shall be 1" bronze bodied valves with a rubber seat and plated cover. Keys shall be bronze constructed with 1" FIP x 1" MIP threaded.
- 2.08 SWING JOINTS:
- A. All rotor heads shall have a one (1") inch unitized "full circle" type, Lasco #G111-212 swing joint. Use teflon tape on all threaded joints and draw joints up snugly, do not over-tighten.
 - B. All spray heads shall installed on flexible pipe.
- 2.09 IRRIGATION HEADS:
- A. Grass Spray Heads: ABS body with a 4" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base; match product of any existing irrigation unless otherwise directed by Owner.
 - B. High-Pop Spray Head: ABS body with a 12" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base; match product of any existing irrigation unless otherwise

- directed by Owner.
 - C. Nozzles: Matched precipitation rates plastic nozzle.
 - D. Rotary Spray Heads: ABS body with a 4" spring loaded pop-up nozzle assembly, gear driven with 12 interchangeable nozzles and 3/4" FIP connection in base; match product of any existing irrigation unless otherwise directed by Owner.
- 2.10 REMOTE CONTROL VALVES:
Normally closed, globe-type diaphragm, glass-filled nylon body and cover, and Buna N reinforced diaphragm with 24-volt, 1/4 amp solenoid in a waterproofed housing. Match product of any existing irrigation unless otherwise directed by Owner.
- 2.11 REINFORCEMENT STAKES:
- A. 1" galvanized pipe long enough to penetrate at least 36" into undisturbed soil. Use two stainless steel worm gear clamps with stainless steel screws to fasten the stake to the quick coupler.
- 2.12 VALVE BOXES:
- A. 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.
 - B. 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.
 - C. 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.
- 2.13 VALVE BOX INSTALLATION AND BACKFILL:
- A. Use manufacturer valve box extensions as necessary to install top of valve box flush with finish grade.
 - B. Securely line interior walls and bottom of valve box with filter fabric
 - C. Install clean, washed gravel graded from 1/2" to 1" diameter in bottom of valve box. Do not bury control valve or isolation valve.
- 2.14 AUTOMATIC CONTROLLER:
- A. If an existing controller is available: connect any new irrigation valves to the existing controllers if possible. Contractor to insure adequate stations are available any all new irrigation. Repair all trench damage to established landscape caused by routing control wiring to controller.
 - B. If a new controller is required: Match product and mounting detail of any new irrigation controller with any existing controllers, unless otherwise directed by Owner.
 - C. Controller shall be equipped with a minimum three (3) independent programs, each with separate day cycles and a minimum of four (4) start times.
 - D. Controller shall be equipped with independent day scheduling options, as well as have water conservation options such as odd/even, budget, and day intervals features.
 - E. Controller shall be equipped with a non-volatile memory.
 - F. Controller shall be sized large enough to provide one station for each valve installed.
 - G. Install per manufacturer's specifications. If exterior installation, insure product is rated for outdoor elements. Provide electrical power as needed as part of the work.

PART 3 - EXECUTION

3.01 DESIGN

- A. As required by State and local code, an irrigation design shall be professionally prepared and submitted for approval as a shop drawing prior to commencement of construction. The irrigation system design shall be customized specifically to the proposed planting of the project.
- B. The designer shall be properly licensed, and in good and current standing with the State in order to present the design and sell the construction services. The design shall be officially sealed by a proper professional as allowed by State law.
- C. The designer shall specify on the drawings all irrigation system components necessary to comply with State law and local code.
- D. It is the intent to provide 1.0" of precipitation for the landscape on this project, during a 7 day watering cycle. Individual zone precipitation rates shall be designed accordingly to provide at least the 1.0" of precipitation per 7 day period.
- E. It is the intent to provide zone separation for this project based on athletic field Turf, shrubs, and flowerbeds, trees and non-athletic field turf. Irrigation Industry standards for head spacing will determine the type of head required in smaller turf areas. In addition, all trees shall be equipped with (1) spray head per tree zoned separately from the shrub and flower bed zones.
- F. All Irrigation sleeving shall be base bid. Irrigation system sleeving will be designed based on using two pvc pipe diameters greater than the pipe(s) being sleeved. Two inch (2") diameter pvc pipe will be used as a minimum size for irrigation wire sleeving. It is the responsibility of the contractor to label on the irrigation design all necessary sleeving for this project. The installation of irrigation sleeving will be the responsibility of the irrigation contractor. Sleeve locations shall be permanently marked on all curbs.
- G. Details will be required with irrigation design for all pertinent construction. Activity, such as valves, controllers, and sprinkler heads.

3.02 INSPECTION

Prior to commencing work, inspect site to verify that the system may be installed as required. The location of underground utilities shall be clearly and distinctly marked prior to start of trenching. Verify property measurements, critical dimensions and finish grades.

3.03 POINT OF CONNECTION (WATER SOURCE)

- A. The irrigation system shall be connected to water supply points of connection as indicated on the approved shop drawings.
- B. The point of connection shall be of an adequate size and as shown on the approved shop drawings.
- C. The Contractor shall be responsible and furnish the point of connection, unless otherwise specified.

3.04 BACKFLOW PREVENTION

Install backflow prevention device in boxes, vaults, or enclosures as required by city code. For subsurface backflow prevention device installation, set boxes and vaults level, plumb and flush with finish grade with a minimum of 18" between any other utility or irrigation component. Center the valve or vault box over the backflow prevention device. Install one backflow prevention device per box or vault.

3.05 ELECTRICAL SUPPLY

- A. Electrical connections for the automatic controller shall be made to electrical points of connection as indicated on the approved shop drawings.
- B. Connections shall be made at approximate locations, as shown on the approved shop drawings. The Contractor is responsible for minor changes caused by actual site conditions.

- C. The Contractor shall be responsible and furnish the electrical connection, unless otherwise specified.

3.06 TRENCHING

Coordinate trenching with other contractors on site. Trenches shall be a minimum of 4 inches wide. All pressurized main line piping shall have a minimum cover of 18" and lateral piping shall have a cover of 12". Minimum cover is measured from top of pipe to finish grade. All excavation shall be unclassified and shall include earth, loose rock, rock or any combination thereof, in wet or dry state.

3.07 BACKFILL

After installing pipe, trenches shall be properly backfill. Backfill shall be rock free and care shall be taken that no rocks or other obstructions rest against the pipe. Water settle backfill in lifts and compact to prevent settling. Contractor shall be responsible for placing additional topsoil, seed or sod to correct depressions after job is completed.

3.08 SLEEVING

Place sleeve pipe for irrigation lines and control wire under hardscape in separate PVC sleeves. Minimum sleeve size shall be 2". Sleeving shall have a minimum of 18" of cover from top of sleeve to bottom of slab and extend into the landscape area a minimum of 6" beyond any hardscape edge.

3.09 PIPE SIZING

Pipe shall be sufficiently sized to not exceed manufacturer's recommendations in volume and velocity.

Maximum velocity shall be 5 feet per second (fps).

Maximum volume per pipe size shall be:

Pipe Size	Max. GPM*
½"	5
¾"	11
1"	16
1 ¼"	26
1 ½"	35
2"	55
2 ½"	80
3"	120
4"	200

* GPM: Gallons per Minute

3.10 PIPE INSTALLATION

Install PVC pipe per manufacturer's specifications. Clean solvent welded joints with primer prior to using solvent. Remove excess primer from each joint.

3.11 HYDROSTATIC TEST

- A. Pressure Test: After pipe is laid, joints completed and trench partially backfilled leaving joints exposed for inspection, subject the main line piping for two (2) hour hydrostatic pressure test of 100 psi, or normal city pressure if greater. Open and close each valve during the test.
- B. Defective Material: Examine carefully each pipe joint, fittings and valves during the test. Joints showing visible leakage shall be replaced or remade as necessary. Removed cracked or defective pipe, joints, fittings or valves and replace with new material and repeat test until results are satisfactory. Replacement and repair shall be made at no

additional expense to Owner.

3.12 REMOTE CONTROL VALVES

Install remote control valves where shown on the approved shop drawings. When valves are grouped together, allow at least twelve (12) 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.

3.13 BALL VALVES, ISOLATION VALVES

Install ball valves where shown on the approved shop drawings. Ball valves, when installed next to another utility or irrigation component, shall have at least twelve (12) inches clearance. Ball valves shall be located and installed at all mainline direction changes (tees and elbows), mainline trunk legs, and on the meter-side of the alignment prior to going under vehicular pavement. For a looped mainline, install at least one (1) ball valve at the mid-point of the mainline. 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.

3.14 QUICK COUPLER VALVES

Install where shown on the approved shop drawings. Quick coupler valves shall be installed within 100' of any proposed tree. 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.

3.15 WIRE INSTALLATION

Install in taped bundles and place next to piping. Follow main line piping wherever possible. Install an expansion coil, 1" dia. x 6" long at all directional changes, at each valve connection, and every 100 ft. Properly insulate and waterproof all wire splices. Control wire less than 2000 ft. shall be continuous without splices or joints from the controller to the valves. Make wire splices in valve boxes, do not bury directly in soil. Run extra wires from the controller to the farthest valve. The common wire shall be one color (white), the valve wires shall be of another color (red), and the extra wire shall be of another color (blue).

3.16 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 approved shop drawing.

3.17 SPRAY HEAD INSTALLATION

- A. Grass spray heads: In turf areas, install with tops flush with finish grade. Set a minimum of 3" from sidewalks or curbs. Installation shall also be with flexible pipe to the lateral pipe.
- B. High-Pop spray heads: In non-turf areas and adjacent to sidewalks or curbs, install with tops flush with finish grade. Installation shall also be with flexible pipe to the lateral pipe.
- C. Nozzles: Adjust direction of throw at each head or change nozzle as required to ensure 100% coverage and minimize over-spray onto hardscape.
- D. Rotary Spray Head: Install with head flush with finish grade and attach to lateral piping with swing joint assembly as specified. Installation shall also be with flexible pipe or swing joint connection to the lateral pipe.

3.18 OPERATIONAL TEST

Upon completion of installation, activate system and adjust for proper operation and efficient distribution of water. Instruct the Owner or his designated representative in the operation and

maintenance of system.

3.19 RECORD DRAWING

- A. Provide "Record Drawing" on diskette in AutoCad showing triangulated dimensioned locations of valves, main line piping and wire routes with any modifications of original design.
- B. Locate all dimensions from two permanent points (building, monuments, sidewalks, curbs or paving).
- C. Record all changes which were made from the contract drawings including changes in pressure and non-pressure lines.
- D. Record all information on a set of blue-line prints of system. Do not use these prints for any other purposes.
- E. Maintain information daily. Keep drawings at site and available for review by Owner or his representative.
- F. After record drawings have been approved, transfer information to C.D. in AutoCad format. Make dimensions accurately at the same scale used on the drawings.

3.20 CONTROLLER CHARTS

- A. Do not prepare charts until Record Drawings have been approved.
- B. Provide a controller chart. Chart may be a reproduction of Record Drawing. If photo reduction prints are used, keep reduction to maximum size possible to retain legibility. Chart shall show the actual area covered by controller.
- C. Identify the area covered by each valve using a distinctly different pastel color, drawn over the entire area of coverage.
- D. Hermetically seal approved charts between 2 layers of 20 mil thick clear plastic sheeting.

3.21 OPERATION AND MAINTENANCE MANUALS

- A. Provide two individually bound manuals detailing operating and maintenance requirements for the system.
- B. Deliver manuals to Owner no later than 10 days prior to completion of work.
- C. Provide descriptions of installed materials and systems in sufficient details to permit maintenance personnel to understand, operate and maintain the equipment.
- D. Provide the following in each manual:
 - 1. Index sheet, stating Irrigation Contractor's name, address, telephone number and name of person to contact.
 - 2. Duration of warranty period.
 - 3. Equipment list providing manufacturer's name, make and model, name and address of local manufacturer's representative, spare parts list, detailed operating and maintenance instructions of major components.

3.22 CLEANUP

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

3.23 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler 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.

3.24 OPERATION

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven (7) calendar days prior to any planting.
- B. The Owner reserves the right to waive or shorten the operation period.

3.25 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Owner, at the time of the final observation. Any items deemed not acceptable by the Owner shall be re-worked to the complete satisfaction of the Owner.
- B. The Contractor shall furnish the Owner with all accessories, charts, record drawings, and equipment as required prior to final inspection.

3.26 OBSERVATION SCHEDULE

- A. When observations have been conducted by someone other than the Owner, show evidence, in writing, of when and by whom these observations were made.
- B. 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 Owner 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 33 1000

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 2333 - Trenching and Backfilling
 - 2. Section 31 0000 - 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 10" 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. All pipe, fittings and appurtenances not covered by this specification shall be approved by the engineer seven days prior to bid.

PART 2 - PRODUCTS

2.01 PIPE

- A. Polyvinyl Chloride (PVC) water pipe and fittings with dimension control.

- 1. PVC Water Pipe, 12": AWWA C900, Class 150, DR-18.
- 2. PVC Water Pipe, 4" through 8": AWWA C900, Class 200, DR-14.

2.02 FIRE HYDRANTS

- A. Manufacture 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 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



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