

# **SPECIFICATIONS**

## **CONSTRUCTION DOCUMENTS**

### **WILL ROGERS STADIUM VISITORS ADDITION**

**3909 East 5th Place**

**TULSA, OKLAHOMA 74112**

**SECTION 00 0101  
PROJECT TITLE PAGE**

**PROJECT MANUAL FOR  
WILL ROGERS STADIUM VISITORS ADDITION CDS  
3909 EAST FIFTH PLACE  
TULSA, OKLAHOMA 74112  
DATE: JANUARY 30, 2023**

**PREPARED BY:**

**REED ARCHITECTURE AND INTERIORS  
18 EAST HOBSON AVENUE  
SAPULPA, OKLAHOMA 74066**

**END OF SECTION**

**DOCUMENT 00 0107  
PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Civil Engineer:

Wallace Design Collective, PC  
123 N Martin Luther King Jr Blvd.  
Tulsa, Oklahoma 74103

**DIVISION 22 – PLUMBING PIPING**

22 1113 Facility Water Distribution Piping  
22 1313 Facility Sanitary Sewers

**DIVISION 31 – EARTHWORK**

31 1000 Site Clearing  
31 1110 Stormwater Pollution Prevention Plan  
31 2000 Earth Moving  
31 2500 Erosion and Sediment Control

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

32 1313 Concrete Paving

**DIVISION 33 – UTILITIES**

33 4100 Storm Drainage Utility Piping

**END OF DOCUMENT**



DOCUMENT 00 0107  
PROFESSIONAL SEALS PAGE

The specification sections listed below were prepared by or under the direct supervision of the Structural Engineer.

Snowden Engineering, Inc.  
8128 East 63rd Street  
Tulsa, Oklahoma 74133

DIVISION 03 - CONCRETE  
03 3000 - Cast-In-Place Concrete  
DIVISION 05 - METALS  
05 1200 - Structural Steel Framing  
05 3100 - Steel Deck



00 0107

February 09, 2023  
Will Rogers Stadium Visitor's Addition  
Tulsa Public Schools

Professional Seals Page  
00 0107  
2

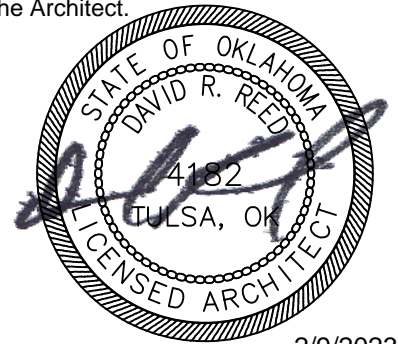
Reed Architecture and Interiors  
18 East Hobson Avenue  
Sapulpa, Oklahoma



**DOCUMENT 00 0107  
PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Architect.

Reed Architecture and Interiors, LLC  
18 East Hobson Avenue  
Sapulpa, Oklahoma 74066



**1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

- A. 00 0110 - Table of Contents
- B. 00 7200 - General Conditions

**SPECIFICATIONS**

**2.01 DIVISION 01 -- GENERAL REQUIREMENTS**

- A. 01 1000 - Summary
- B. 01 2500 - Substitution Procedures
- C. 01 3000 - Administrative Requirements
- D. Electronic Data Waiver and Indemnity Agreement
- E. 01 4000 - Quality Requirements
- F. 01 4533 - Code-Required Special Inspections
- G. 01 5000 - Temporary Facilities and Controls
- H. 01 6000 - Product Requirements
- I. 01 7000 - Execution and Closeout Requirements
- J. 01 7800 - Closeout Submittals
- K. 01 7900 - Demonstration and Training

**2.02 DIVISION 02 -- EXISTING CONDITIONS**

- C. 02 4100 - Demolition

**2.03 DIVISION 03 -- CONCRETE**

- B. 03 3511 - Concrete Floor Finishes

**2.04 DIVISION 04 -- MASONRY**

- A. 04 2000 - Unit Masonry

**2.05 DIVISION 05 -- METALS**

- C. 05 4000 - Cold-Formed Metal Framing
- D. 05 5000 - Metal Fabrications

**2.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES**

- A. 06 1000 - Rough Carpentry

**2.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION**

- A. 07 1400 - Fluid-Applied Waterproofing
- B. 07 1900 - Water Repellents
- C. 07 2100 - Thermal Insulation
- D. 07 2400 - Exterior Insulation and Finish Systems
- E. 07 5100 - Multi-Ply Cold Process Roofing
- F. 07 6200 - Sheet Metal Flashing and Trim
- G. 07 7100 - Roof Specialties

2/9/2023

- H. 07 7123 - Manufactured Gutters and Downspouts
- I. 07 7200 - Roof Accessories
- J. 07 8400 - Firestopping
- K. 07 9200 - Joint Sealants

**2.08 DIVISION 08 -- OPENINGS**

- A. 08 1113 - Hollow Metal Doors and Frames
- B. 08 3100 - Access Doors and Panels
- C. 08 3313 - Coiling Counter Doors
- D. 08 5659 - Service and Teller Window Units
- E. 08 7100 - Door Hardware
- F. 08 8000 - Glazing
- G. 08 8300 - Mirrors

**2.09 DIVISION 09 -- FINISHES**

- A. 09 2116 - Gypsum Board Assemblies
- B. 09 2216 - Non-Structural Metal Framing
- C. 09 5100 - Acoustical Ceilings
- D. 09 9113 - Exterior Painting
- E. 09 9123 - Interior Painting
- F. 09 9600 - High-Performance Coatings

**2.10 DIVISION 10 -- SPECIALTIES**

- A. 10 1400 - Signage
- B. 10 2113.17 - Phenolic Toilet Compartments
- C. 10 2600 - Wall and Door Protection
- D. 10 2813 - Toilet Accessories
- E. 10 4400 - Fire Protection Specialties
- F. 10 7316.13 - Metal Canopies

**2.11 DIVISION 11 -- EQUIPMENT**

- A. 11 4001 - Custom Fabricated Foodservice Equipment

**2.12 DIVISION 12 -- FURNISHINGS**

- B. 12 6600 - Fixed Aluminum Bleachers

**2.17 DIVISION 31 -- EARTHWORK**

- E. 31 3116 - Termite Control

**2.18 DIVISION 32 -- EXTERIOR IMPROVEMENTS**

- B. 32 3113 - Chain Link Fences and Gates

**END OF SECTION**

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VISITOR'S ADDITION

DIVISION 22 - PLUMBING

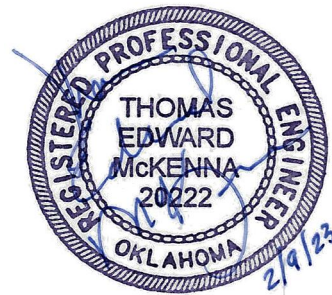
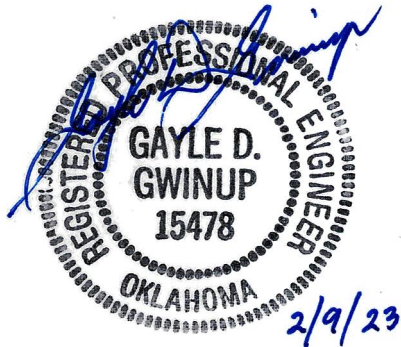
SECTION 220400 – PLUMBING

DIVISION 23 - MECHANICAL

SECTION 230600- HEATING, VENTILATING, AND AIR CONDITIONING

DIVISION 26 – ELECTRICAL

SECTION 260400- ELECTRICAL SYSTEMS



**SECTION 00 0110  
TABLE OF CONTENTS**

**PROCUREMENT AND CONTRACTING REQUIREMENTS**

**1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

- A. 00 0101 - Project Title Page
- B. 00 0107 - Seals Pages
- C. 00 0110 - Table of Contents
- D. 00 7200 - General Conditions
- E. 00 7300 - Supplementary Conditions

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- H. 01 6000 - Product Requirements
- I. 01 7000 - Execution and Closeout Requirements
- J. 01 7800 - Closeout Submittals
- K. 01 7900 - Demonstration and Training

**2.02 DIVISION 02 -- EXISTING CONDITIONS**

- A. For Site Preparation and Earthwork, see Division 31
- B. For Site Utilities, see Division 33
- C. 02 4100 - Demolition

**2.03 DIVISION 03 -- CONCRETE**

- A. 03 3000 - Cast-in-Place Concrete
- B. 03 3511 - Concrete Floor Finishes

**2.04 DIVISION 04 -- MASONRY**

- A. 04 2000 - Unit Masonry

**2.05 DIVISION 05 -- METALS**

- A. 05 1200 - Structural Steel Framing
- B. 05 3100 - Metal Deck
- C. 05 4000 - Cold-Formed Metal Framing
- D. 05 5000 - Metal Fabrications
- E. 05 5213 - Pipe and Tube Railings

**2.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES**

- A. 06 1000 - Rough Carpentry

**2.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION**

- A. 07 1400 - Fluid-Applied Waterproofing

- B. 07 1900 - Water Repellents
- C. 07 2100 - Thermal Insulation
- D. 07 2400 - Exterior Insulation and Finish Systems
- E. 07 2500 - Weather Barriers
- F. 07 4113 - Metal Roof Panels
- G. 07 4213.19 - Insulated Metal Wall Panels
- H. 07 6200 - Sheet Metal Flashing and Trim
- I. 07 7100 - Roof Specialties
- J. 07 7123 - Manufactured Gutters and Downspouts
- K. 07 9200 - Joint Sealants

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- A. 08 1113 - Hollow Metal Doors and Frames
- B. 08 3100 - Access Doors and Panels
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- A. 11 4001 - Custom Fabricated Foodservice Equipment

## **2.12 DIVISION 12 -- FURNISHINGS**

- A. 12 6600 - Fixed Aluminum Bleachers

## **2.13 DIVISION 22 -- PLUMBING**

- A. 22 0400 - Plumbing
- B. 22 1113 - Facility Water Distribution Piping
- C. 22 1313 - Facility Sanitary Sewers

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

- A. 23 0600 - Heating Ventilating and Air Conditioning

**2.15 DIVISION 26 -- ELECTRICAL**

- A. 26 0400 - Electrical Systems

**2.16 DIVISION 31 -- EARTHWORK**

- A. 31 1000 - Site Clearing
- B. 31 1100 - Stormwater Pollution Prevention Plan
- C. 31 2000 - Earth Moving
- D. 31 2500 - Erosion and Sedimentation Control
- E. 31 3116 - Termite Control

**2.17 DIVISION 32 -- EXTERIOR IMPROVEMENTS**

- A. 32 1313 - Concrete Paving
- B. 32 3113 - Chain Link Fences and Gates

**2.18 DIVISION 33 -- UTILITIES**

- A. 33 4100 - Storm Drainage Utility Piping

**END OF SECTION**

**SECTION 00 7200  
GENERAL CONDITIONS**

**FORM OF GENERAL CONDITIONS**

**1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS AIA DOCUMENT  
A201-2017 EDITION INCLUDED HEREIN BY REFERENCE.**

**RELATED REQUIREMENTS**

**SUPPLEMENTARY CONDITIONS**

**3.01 REFER TO DOCUMENT 00 7300 - SUPPLEMENTARY CONDITIONS FOR AMENDMENTS TO  
THESE GENERAL CONDITIONS.**

**END OF SECTION**

**SECTION 00 7301  
SUPPLEMENTARY GENERAL CONDITIONS**

**THIS SUPPLEMENT TO THE GENERAL CONDITIONS IS EXECUTED SIMULTANEOUSLY WITH AND CONSTITUTES A PART OF THE STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR, AIA A101-2017 AND GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A201-2017 EDITION.**

**THIS SUPPLEMENT MODIFIES THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AIA DOCUMENT A201-2017 AND TO THE EXTENT THAT THERE IS ANY CONFLICT BETWEEN THE PRINTED GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION AND THIS SUPPLEMENT, THE TERMS OF THIS SUPPLEMENT SHALL CONTROL. THE GENERAL CONDITIONS AS MODIFIED BY THIS SUPPLEMENT CONTAIN TERMS REGARDING THE DUTIES OF THE ARCHITECT TO THE OWNER AND THE RELATIONSHIP AMONG THE ARCHITECT, CONTRACTOR AND THE OWNER.**

**THE FOLLOWING SECTION NUMBERS CORRESPOND TO THE NUMBERING OF THE ARTICLES IN THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION. SECTIONS THAT ARE SUBSTITUTED OR MODIFIED ARE SET FORTH UNDER THE CORRESPONDING SECTION USED IN THE GENERAL CONDITIONS. IF NEW MATERIALS ARE ADDED, THE SECTION NUMBERS FOR THOSE PROVISIONS ARE NUMBERED TO BE CONSISTENT WITH THE GENERAL CONDITIONS FORMAT.**

**ARTICLE 1- GENERAL PROVISIONS:**



**BASIC DEFINITIONS:**

REPLACE THE LAST SENTENCE IN SECTION 1.1.1 WITH THE FOLLOWING:

"THE CONTRACT DOCUMENTS 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 CONTRACTORS BID OR PROPOSAL, AND PORTIONS OF ADDENDA RELATING TO BIDDING REQUIREMENTS."

**EXECUTION, CORRELATION AND INTENT:**

ADD THE FOLLOWING CLAUSE 1.2.3.1 TO SECTION 1.2.3

"1.2.3.1 IN THE EVENT OF CONFLICTS OR DISCREPANCIES AMONG THE CONTRACT DOCUMENTS. INTERPRETATIONS WILL BE BASED ON THE FOLLOWING PRIORITIES:

1. ADDENDA, WITH THOSE OF LATER DATE HAVING PRECEDENCE OVER THOSE OF EARLIER DATE
2. THE SUPPLEMENTARY CONDITIONS
3. THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION
4. DIVISION 1 OF THE SPECIFICATIONS
5. DRAWINGS AND DIVISION 2-49 OF THE SPECIFICATIONS. IN THE CASE OF CONFLICTS OR DISCREPANCIES BETWEEN DRAWINGS AND DIVISION 2-49 OF THE SPECIFICATIONS, OR WITHIN EITHER DOCUMENT NOT CLAIPIED BY ADDENDUM, THE ARCHITECT WILL DETERMINE WHICH TAKES PRECEDENCE IN ACCORDANCE WITH SECTION 4.2.12.
6. ALTERNATES IN THE CONTRACT DOCUMENTS."

**PERIODIC MEETINGS:**

ADD THE FOLLOWING SECTION 1.9, AND SUBSEQUENT SECTION 1.9.1:

"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."

**ARTICLE 2- OWNER:**

**INFORMATION AND SERVICES REQUIRED OF THE OWNER:**

SUBSECTION 2.2.3 SHALL BE REVISED TO READ AS FOLLOWS:

" EXCEPT WHERE SPECIFICALLY REQUIRED OF A CONTRACTOR, THE OWNER SHALL FURNISH SURVEYS DESCRIBING THE SITE OF THE PROJECT. THE OWNER MAKES NO REPRESENTATIONS CONCERNING THE ACCURACY OR COMPLETENESS OF THIS SURVEY. SUCH SURVEYS MAY CONTAIN DESCRIPTIONS OF PHYSICAL CHARACTERISTICS, LEGAL LIMITATIONS, UTILITY LOCATIONS, PERMANENT BENCHMARKS, EXISTING STRUCTURES, SLOPES AND CONTOURS, LEGAL DESCRIPTIONS AND OTHER SUCH PERTINENT INFORMATION. SUCH OWNER-FURNISHED SURVEYS MAY BE BOUND WITH THE DRAWINGS OR MAY BE FULLY OR PARTIALLY TRANSCRIBED ON THE PLOT PLAN OR SITE PLAN DRAWING. ANY SUCH SURVEY SHALL NOT BE A PART OF THE CONTRACT DOCUMENTS, BUT WILL BE PROVIDED FOR INFORMATION PURPOSES."

ADD THE FOLLOWING CLAUSE 2.2.4.1 TO SECTION 2.2.4:

"THE OWNER WILL SELECT THE APPROPRIATE TESTING LABORATORY FOR STRUCTURAL TESTS AND SPECIAL INSPECTIONS AS REQUIRED BY THE APPLICABLE BUILDING CODE."

**ARTICLE 3- CONTRACTOR:**

**REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR:**

CHANGE SECTION 3.2.2 AS FOLLOWS:

**"IN THE SECOND SENTENCE CHANGE THE PHRASE 'REQUEST FOR INFORMATION' TO 'REQUEST FOR INTERPRETATION'".**

**CHANGE SECTION 3.2.3 AS FOLLOWS:**

**IN THE FIRST SENTENCE CHANGE THE PHRASE 'REQUEST FOR INFORMATION' TO 'REQUEST FOR INTERPRETATION'".**

**ADD THE FOLLOWING SUBSECTION 3.2.5 TO SECTION 3.2:**

**"THE OWNER SHALL BE ENTITLED TO DEDUCT FROM THE CONTRACT SUM AMOUNTS PAID TO THE ARCHITECT FOR THE ARCHITECT TO EVALUATE AND RESPOND TO THE CONTRACTOR'S REQUESTS FOR INTERPRETATION, WHERE SUCH INFORMATION WAS AVAILABLE TO THE CONTRACTOR FROM A CAREFUL STUDY AND COMPARISON TO THE CONTRACT DOCUMENTS, FIELD CONDITIONS, OTHER OWNER-PROVIDED INFORMATION, CONTRACTOR-PREPARED COORDINATION DRAWINGS, OR PRIOR PROJECT CORRESPONDENCE OR DOCUMENTATION."**

**ADD THE FOLLOWING SECTION 3.2.5 TO SECTION 3.2:**

**" 3.2.5: THE CONTRACTOR SHALL PERFORM THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND SUBMITTALS APPROVED PURSUANT TO SECTION 3.1.2."**

**LABOR AND MATERIALS:**

**DELETE SECTION 3.4.2 AND SUBSTITUTE THE FOLLOWING SECTION 3.4.2 TO SECTION 3.4:**

**"AFTER THE CONTRACT HAS BEEN EXECUTED, THE OWNER AND ARCHITECT WILL CONSIDER A FORMAL REQUEST FOR THE SUBSTITUTION OF PRODUCTS IN PLACE OF THOSE SPECIFIED ONLY UNDER THE CONDITIONS SET FORTH IN THE DIVISION 1 OF THE SPECIFICATIONS.**

**FOR SUBSTITUTIONS, THE CONTRACTOR:**

**REPRESENTS THAT THE SUB-CONTRACTOR HAS PERSONALLY INVESTIGATED THE SUBSTITUTE PRODUCT AND DETERMINED THAT IT IS EQUAL OR SUPERIOR IN ALL RESPECTS TO THAT SPECIFIED.**

**REPRESENTS THAT THE SUB-CONTRACTOR WILL PROVIDE THE SAME WARRANTY FOR THE SUBSTITUTION THAT THE CONTRACTOR WOULD FOR THAT SPECIFIED;**

**CERTIFIES THAT THE COST DATA PRESENTED IS COMPLETE AND INCLUDES ALL RELATED COSTS UNDER THIS CONTRACT EXCEPT THE ARCHITECT'S REDESIGN COSTS, AND WAIVES ALL CLAIMS FOR ADDITIONAL COSTS RELATED TO THE SUBSTITUTION WHICH SUBSEQUENTLY BECOME APPARENT; AND WILL COORDINATE THE INSTALLATION OF THE ACCEPTED SUBSTITUTE, MAKING SUCH CHANGES AS MAY BE REQUIRED FOR THE WORK TO BE COMPLETE IN ALL RESPECTS."**

**ADD THE FOLLOWING SUBSECTION 3.4.4 TO SECTION 3.4:**

**"THE OWNER SHALL BE ENTITLED TO DEDUCT FROM THE CONTRACT SUM ANY AMOUNTS PAID TO THE ARCHITECT TO EVALUATE THE CONTRACTOR'S PROPOSED SUBSTITUTIONS AND TO MAKE AGREED UPON CHANGES IN THE DRAWINGS AND SPECIFICATIONS MADE NECESSARY BY THE OWNER'S ACCEPTANCE OF SUCH SUBSTITUTIONS."**

**TAXES:**

**ADD THE FOLLOWING SECTION 3.6.1 TO SECTION 3.6:**

**"THE CONTRACTOR ASSUMES FULL RESPONSIBILITY FOR THE PAYMENT OF ALL CONTRIBUTIONS AND PAYROLL TAXES (STATE AND FEDERAL) AS TO ALL SUBCONTRACTORS AND EMPLOYEES ENGAGED IN THE PERFORMANCE OF WORK PURSUANT HERETO, AND FURTHER AGREES TO CHECK AND MEET ALL REQUIREMENTS THAT MIGHT BE SPECIFIED UNDER REGULATIONS OF THE ADMINISTRATIVE OFFICIAL OR BOARD CHARGED WITH THE ENFORCEMENT OF ANY STATE OR FEDERAL ACT ON THE SUBJECT REFERRED TO. CONTRACTOR AGREES TO FURNISH THE OWNER, UPON REQUEST, A CERTIFICATE OR OTHER EVIDENCE OF COMPLIANCE THEREWITH."**

**PERMITS, FEES AND NOTICES:**

**ADD THE FOLLOWING TO SECTION 3.7.2:**

**“IN GENERAL, IT IS NOT THE CONTRACTOR’S RESPONSIBILITY TO ASCERTAIN THAT THE CONTRACT DOCUMENTS ARE IN ACCORDANCE WITH APPLICABLE LAWS, ORDINANCES, STATUTES, BUILDING CODES AND RULES AND REGULATIONS. HOWEVER, CONTRACTORS PRACTICING BUILDING TRADES LICENSED BY REGULATORY AUTHORITIES SHALL BE HELD RESPONSIBLE FOR FULL AND COMPLETE KNOWLEDGE OF ALL APPLICABLE LAW, ORDINANCES, STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS AS THEY APPLY TO THEIR OWN LICENSED TRADE. WHERE THE CONTRACT DOCUMENTS SPECIFICALLY DIRECT THAT PORTIONS OF THE WORK BE COMPLETED IN COMPLIANCE WITH CERTAIN OR APPLICABLE LAWS, ORDINANCES, STATUTES, STANDARD, BUILDING CODES, RULES AND REGULATIONS, IT IS THE CONTRACTOR’S DUTY, OBLIGATION, AND RESPONSIBILITY TO DILIGENTLY AND CAREFULLY RESEARCH AND STUDY AND TO ACQUIRE FULL KNOWLEDGE OF SUCH LAWS, ORDINANCES, STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS. IF THE CONTRACTOR OBSERVES THAT PORTIONS OF THE CONTRACT DOCUMENTS ARE AT VARIANCE FROM APPLICABLE LAWS, ORDINANCES, STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS, OR IS INFORMED OF SUCH VARIANCE BY ANY PUBLIC AUTHORITY OR OTHER ENTITY, THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT AND OWNER IN WRITING, AND NECESSARY CHANGES SHALL BE ACCOMPLISHED BY APPROPRIATE MODIFICATION. NOTHING IN THESE REQUIREMENTS SHALL RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY FOR COMPLIANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS WHERE THOSE REQUIREMENTS EXCEED THOSE OF THE APPLICABLE LAWS, ORDINANCES, AND STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS.”**

**ADD THE FOLLOWING TO SECTION 3.7.3:**

**“CLAIMS FOR ADDITIONAL COSTS WILL NOT BE APPROVED BY THE OWNER FOR CHANGES REQUIRED TO COMPLY WITH APPLICABLE LAWS, ORDINANCES, STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS FOR THOSE PORTIONS OF THE WORK FOR WHICH THE CONTRACTOR IS REQUIRED BY THE CONTRACT DOCUMENTS TO HAVE KNOWLEDGE. SHOULD APPLICABLE LAWS, ORDINANCES, STATUTES, STANDARDS, BUILDING CODES, RULES AND REGULATIONS CHANGE BETWEEN THE BID DATE AND THE COMMENCEMENT OF THE WORK OR DURING THE PROGRESS OF THE WORK, OR COMMENTS RECEIVED BY CITY INSPECTORS NOT INCORPORATED INTO CONTRACT DOCUMENTS AND SHOULD SUCH CHANGE REQUIRE THE CONTRACTOR TO PERFORM EITHER MORE OR LESS WORK, THE CONTRACT SUM AND CONTRACT TIME SHALL BE APPROPRIATELY ADJUSTED IN COMPLIANCE WITH THE REQUIREMENTS OF ARTICLE 7, CHANGES IN THE WORK.”**

**ALLOWANCES:**

**DELETE THE PERIOD AT THE END OF CLAUSE 3.8.2.3 AND ADD THE FOLLOWING:**

**“EXCEPT THAT IF THE INSTALLATION IS INCLUDED AS PART OF AN ALLOWANCE IN DIVISIONS 1-49 OF THE SPECIFICATIONS, THE INSTALLATION AND LABOR COST FOR GREATER OR LESSER QUANTITIES OF WORK SHALL BE DETERMINED IN ACCORDANCE WITH SECTION 7.3.7.”**

**ADD THE FOLLOWING SUBSECTION 3.9.4 TO SECTION 3.9:**

**"THE CONTRACTOR SHALL EMPLOY A FULL TIME SUPERINTENDENT OR AN ASSISTANT TO THE SUPERINTENDENT WHO WILL PERFORM AS A COORDINATOR FOR MECHANICAL AND ELECTRICAL SYSTEMS. THE COORDINATOR SHALL BE KNOWLEDGEABLE IN MECHANICAL AND ELECTRICAL SYSTEMS AND CAPABLE OF READING, INTERPRETING AND COORDINATING DRAWINGS, SPECIFICATIONS, AND SHOP DRAWINGS PERTAINING TO SUCH SYSTEMS. THE COORDINATOR SHALL ASSIST THE SUBCONTRACTORS IN ARRANGING SPACE CONDITIONS TO ELIMINATE INTERFERENCE BETWEEN THE MECHANICAL AND ELECTRICAL SYSTEMS AND OTHER WORK AND SHALL SUPERVISE THE PREPARATION OF COORDINATION DRAWINGS DOCUMENTING THE SPATIAL ARRANGEMENTS FOR SUCH SYSTEMS WITHIN RESTRICTED SPACES. THE COORDINATOR SHALL ASSIST IN PLANNING AND EXPEDITING THE PROPER SEQUENCE OF DELIVERY OF MECHANICAL AND ELECTRICAL EQUIPMENT TO THE SITE."**

**CONTRACTOR'S CONSTRUCTION SCHEDULES:**

**ADD THE FOLLOWING SECTION 3.10.4 TO SECTION 3.10:**

**"NOTHING IN THE REQUIREMENT TO SUBMIT CONSTRUCTION SCHEDULES, OR TO REVISE SUCH SCHEDULES OR ANY REVIEW OF SUCH SCHEDULES BY THE OWNER OR ARCHITECT, SHALL GIVE RISE TO A DUTY, OBLIGATION, OR RESPONSIBILITY OF THE OWNER OR ARCHITECT TO THE CONTRACTOR, SUBCONTRACTOR, MATERIAL SUPPLIER OR ANY OTHER ENTITY INVOLVED IN THE WORK, TO ENSURE COMPLETION OF THE WORK WITHIN THE CONTRACT TIME. IT IS THE SOLE DUTY, RESPONSIBILITY, AND OBLIGATION OF THE CONTRACTOR TO COMPLETE THE WORK WITHIN THE CONTRACT TIME."**

**SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:**

**ADD THE FOLLOWING SENTENCE TO SECTION 3.12.5:**

**"SUBMITTALS WHICH ARE NOT MARKED AS REVIEWED FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS AND APPROVED BY THE CONTRACTOR MAY BE RETURNED BY THE ARCHITECT WITHOUT ACTION."**

**ADD THE FOLLOWING SENTENCE TO SUBSECTION 3.12.9:**

**"SPECIFIC ATTENTION IN WRITING SHALL BE DEFINED AS A LETTER SUBMITTED WITH THE SHOP DRAWINGS, PRODUCT DATA, SAMPLE OR SIMILAR SUBMITTAL WHICH SHALL CONTAIN THE FOLLOWING PHRASE: "YOUR ATTENTION IS DIRECTED TO THE FOLLOWING REVISIONS WHICH ARE IN ADDITION TO THOSE REVISIONS THAT YOU REQUESTED", FOLLOWED BY A DETAILED WRITTEN LISTING OF ALL SUCH REVISIONS."**

**ADD SECTION 3.12.11 TO SECTION 3.12:**

**"THE ARCHITECT'S REVIEW OF CONTRACTOR'S SUBMITTALS WILL BE LIMITED TO EXAMINATION OF AN INITIAL SUBMITTAL AND ONE (1) RE-SUBMITTAL. THE ARCHITECT'S REVIEW OF ADDITIONAL SUBMITTALS WILL BE MADE ONLY WITH THE CONSENT OF THE OWNER AFTER NOTIFICATION BY THE ARCHITECT. THE OWNER SHALL BE ENTITLED TO DEDUCT FROM THE CONTRACT SUM AMOUNTS PAID TO THE ARCHITECT FOR EVALUATION OF SUCH ADDITIONAL RE-SUBMITTALS."**

**INDEMNIFICATION:**

**MODIFY SECTION 3.18.1 AS FOLLOWS:**

"TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER, ARCHITECT, AND THEIR CONSULTANTS, AGENTS AND EMPLOYEES OF ANY OF THEM, FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES, INCLUDING, BUT NOT LIMITED TO, ATTORNEYS' FEES, ARISING OUT OF OR RESULTING FROM THE PERFORMANCE OR NON-PERFORMANCE OF THE WORK, TO THE EXTENT CAUSED IN WHOLE OR IN PART BY THE NEGLIGENT ACTS OR OMISSIONS, OR FAILURE TO FOLLOW THE CONTRACT DOCUMENTS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, OR ANYONE FOR WHOSE ACTS MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS OR EXPENSE IS CAUSED IN PART BY ANY PARTY INDEMNIFIED HEREUNDER. SUCH OBLIGATION SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE, OR REDUCE OTHER RIGHTS OR OBLIGATIONS OF INDEMNITY WHICH WOULD OTHERWISE EXIST TO A PARTY OR PERSON DESCRIBED IN THIS PARAGRAPH. IN ADDITION TO OTHER REMEDIES, THE OWNER IS ENTITLED TO WITHHOLD PAYMENTS DUE UNDER THIS CONTRACT TO REIMBURSE THE PARTIES INDEMNIFIED UNDER THIS SECTION."

#### **ARTICLE 4- ARCHITECT:**

##### **ADMINISTRATION OF THE CONTRACT:**

DELETE SECTION 4.2.1 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 4.2.1 TO SECTION 4.2:

"THE ARCHITECT WILL PROVIDE ADMINISTRATION OF THE CONTRACT AS DESCRIBED IN THE CONTRACT DOCUMENTS, AND WILL BE THE OWNER'S REPRESENTATIVES (1) DURING CONSTRUCTION, (2) UNTIL FINAL PAYMENT IS DUE AND (3) WITH THE OWNER'S CONCURRENCE, FROM TIME TO TIME DURING THE CORRECTION PERIOD DESCRIBED IN SECTION 12.2. THE ARCHITECT WILL ADVISE AND CONSULT WITH THE OWNER AND WILL HAVE AUTHORITY TO ACT ON BEHALF OF THE OWNER ONLY TO THE EXTENT PROVIDED IN THE CONTRACT DOCUMENTS, UNLESS OTHERWISE MODIFIED BY WRITTEN INSTRUMENT IN ACCORDANCE WITH OTHER PROVISIONS OF THE CONTRACT."

ADD THE FOLLOWING CLAUSE 4.2.2.1 TO SUBSECTION 4.2.2:

"THE CONTRACTOR SHALL REIMBURSE THE OWNER FOR COMPENSATION PAID TO THE ARCHITECT FOR ADDITIONAL SITE VISITS MADE NECESSARY BY THE FAULT, NEGLIGENCE OR REQUEST OF THE CONTRACTOR."

#### **ARTICLE 5- SUBCONTRACTORS:**

##### **AWARD OF SUBCONTRACTS & OTHER CONTRACTS FOR PORTIONS OF THE WORK:**

DELETE SECTION 5.2.3 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 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. THE CONTRACT SUM SHALL BE INCREASED OR DECREASED BY THE DIFFERENCE IN COST OCCASIONED BY SUCH CHANGE AND AN APPROPRIATE CHANGE ORDER SHALL BE ISSUED. HOWEVER, NO INCREASE IN THE CONTRACT SUM SHALL BE ALLOWED FOR SUCH CHANGE UNLESS THE CONTRACTOR HAS ACTED PROMPTLY AND RESPONSIVELY IN SUBMITTING NAMES AS REQUIRED."

DELETE SECTION 5.2.4 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 5.2.4:

"THE CONTRACTOR SHALL NOT CHANGE A SUBCONTRACTOR, PERSON OR ENTITY PREVIOUSLY SELECTED IF THE OWNER OR ARCHITECT MAKES REASONABLE OBJECTION TO SUCH CHANGE."

#### **CONTINGENT ASSIGNMENT OF SUB-CONTRACTS:**

**DELETE SECTION 5.4.2 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 5.4.2:**

**"IF THE WORK HAS BEEN SUSPENDED FOR MORE THAN THIRTY (30) DAYS, THE SUBCONTRACTOR'S COMPENSATION SHALL BE EQUITABLY ADJUSTED TO REFLECT THE WORK COMPLETED BY EACH SUBCONTRACTOR."**

**ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS:**

**ADD NEW SUBSECTION 6.2.6 IMMEDIATELY FOLLOWING SUBSECTION 6.2.5 TO READ AS FOLLOWS:**

**"SHOULD A CLAIM AGAINST THE OWNER BE FILED BY A SEPARATE CONTRACTOR ALLEGING DAMAGE CAUSED BY THE CONTRACTOR, THE OWNER SHALL NOTIFY THE CONTRACTOR OF SUCH CLAIM. THE CONTRACTOR SHALL DEFEND THE OWNER IN ALL CLAIM PROCEEDINGS AT THE CONTRACTOR'S EXPENSE. SHOULD AN AWARD OR JUDGMENT AGAINST THE OWNER BE SECURED BY THE SEPARATE CONTRACTOR, THE CONTRACTOR SHALL PAY OR SATISFY SAID AWARD OR JUDGMENT AND SHALL REIMBURSE THE OWNER FOR ALL ATTORNEY'S FEES, COURT COSTS, AND ALL OTHER COSTS OR EXPENSES WHICH THE OWNER HAS INCURRED."**

**ARTICLE 7 – CHANGES IN THE WORK:**

**MODIFY SUBSECTION 7.3.8 TO READ AS FOLLOWS:**

**"THE AMOUNT OF CREDIT OR ADDITION FOR A CHANGE WHICH RESULTS IN A NET INCREASE OR DECREASE IN THE CONTRACT SUM SHALL BE ACTUAL NET COST AS CONFIRMED BY THE ARCHITECT TO INCLUDE A REASONABLE CORRESPONDING ADJUSTMENT FOR OVERHEAD AND PROFIT. WHEN BOTH ADDITIONS AND CREDITS ARE INVOLVED IN A CHANGE, THE OVERHEAD AND NET PROFIT ALLOWANCE SHALL BE CALCULATED ON THE BASIS OF THE NET CHANGE."**

**ADD NEW SUBSECTION 7.3.11 IMMEDIATELY FOLLOWING SUBSECTION 7.3.10; TO READ AS FOLLOWS:**

**"7.3.11 PRIOR TO FINAL PAYMENT, ALL CONSTRUCTION CHANGE DIRECTIVES ISSUED DURING THE PROGRESS OF THE WORK SHALL BE CONVERTED TO CHANGE ORDERS AND SIGNED BY THE CONTRACTOR, ARCHITECT AND OWNER. SHOULD THE PARTIES FAIL TO AGREE WITH THE DETERMINATION MADE BY THE ARCHITECT CONCERNING ADJUSTMENTS IN THE CONTRACT SUM AND THE CONTRACT TIME, OR OTHERWISE FAIL TO REACH AGREEMENTS UPON THE ADJUSTMENTS, THAT PORTION OF THE FINAL PAYMENT WHICH IS AFFECTED BY THE DISPUTE, IF ANY, SHALL BE WITHHELD PENDING FINAL JUDGMENT ISSUED BY A COURT OF COMPETENT JURISDICTION."**

**ADD NEW SECTION, 7.5 EXPEDITING CHANGES IN THE WORK, IMMEDIATELY FOLLOWING SECTION 7.4 TO READ AS FOLLOWS:**

**"7.5 EXPEDITING CHANGES IN THE WORK:**

**THE CONTRACTOR SHALL NOT PROCEED WITH CHANGES IN THE WORK AUTHORIZED UNDER PARAGRAPHS 7.2 OR 7.3 UNTIL RECEIPT OF THE APPROPRIATE SIGNED DOCUMENTS."**

**ARTICLE 8 – TIME:**

**DELETE SUBSECTION 8.2.1 AND SUBSTITUTE THE FOLLOWING NEW SUBSECTION 8.2.1:**

**"TIME LIMITS AND TIME FOR PERFORMANCE AS STATED IN THE CONTRACT**

DOCUMENTS ARE THE ESSENCE OF THE CONTRACT. HOWEVER, IF THE LAST DAY TO PERFORM, FALLS ON A HOLIDAY, SATURDAY OR SUNDAY, THE TIME TO ACT WILL BE EXTENDED TO THE NEXT BUSINESS DAY. BY EXECUTING THE AGREEMENT, THE CONTRACTOR CONFIRMS THAT THE CONTRACT TIME IS REASONABLE PERIOD FOR PERFORMING SUCH WORK, INCLUDING DELAYS CAUSED BY ANTICIPATED ADVERSE WEATHER DAYS."

**DELAYS AND EXTENSIONS OF TIME:**

DELETE SECTION 8.3.1 AND SUBSTITUTE THE FOLLOWING NEW SECTION 8.3.1:

"8.3.1: IF THE CONTRACTOR IS DELAYED AT ANY TIME IN PROGRESS OF THE WORK BY AN ACT OR NEGLECT OF THE OWNER, ARCHITECT, ANY OF THE OTHER CONTRACTORS OR ANY EMPLOYEE OF ANY OF THEM, OR BY CHANGES ORDERED IN THE WORK, OR BY LABOR DISPUTES, FIRE, UNUSUAL DELAY IN DELIVERIES, UNAVOIDABLE CASUALTIES, OR OTHER CAUSES BEYOND THE CONTRACTOR'S CONTROL, OR BY DELAY AUTHORIZED BY THE OWNER PENDING RESOLUTION OF CLAIMS, OR BY OTHER CAUSES WHICH THE ARCHITECT, DETERMINES MAY JUSTIFY DELAY, THEN THE CONTRACT TIME MAY BE EXTENDED BY CHANGE ORDER FOR SUCH REASONABLE TIME AS THE ARCHITECT MAY DETERMINE. ARCHITECT SHALL NOTIFY OWNER OF ALL DELAYS IN PROGRESS. IF ANY DELAY WILL CAUSE THE POSTPONEMENT OF OCCUPANCY OF THE FACILITY, ARCHITECT SHALL NOTIFY OWNER IN ADVANCE OF AUTHORIZING SUCH DELAY, AND CONTRACTOR, ARCHITECT AND OWNER SHALL MEET TO DETERMINE ALTERNATIVES TO AVOID DELAY IN OPENING THE FACILITY."

**ARTICLE 9 – PAYMENTS AND COMPLETION:**

**SCHEDULE OF VALUES:**

ADD THE SECTION NUMBER 9.2.1.

"9.2.1. THE SCHEDULE OF VALUES SHALL BE SUFFICIENT OF DETAIL TO PERMIT THE OWNER REASONABLE ACCURATE VERIFICATION OF COMPLETION; DIVIDING LARGE DIVISIONS OF THE WORK AND GROUPING SMALL DIVISIONS OF THE WORK BY SEQUENCED EVENTS IN DELIVERY OF PRODUCTS TO THE SITE AND EXECUTION OF THE WORK."

**APPLICATIONS FOR PAYMENT:**

ADD THE FOLLOWING SENTENCE TO SECTION 9.3.1

"THE FORM OF APPLICATION FOR PAYMENT, DULY NOTARIZED, SHALL BE A CURRENT AUTHORIZED EDITION OF AIA DOCUMENT G702 TM APPLICATION AND CERTIFICATE FOR PAYMENT, SUPPORTED BY A CURRENT AUTHORIZED EDITION OF AIA DOCUMENT G703TM, CONTINUATIONSHEET."

ADD NEW CLAUSE 9.3.1.3 IMMEDIATELY FOLLOWING CLAUSE 9.3.1.2, TO READ AS FOLLOWS:

"9.3.1.3 THE OWNER SHALL PAY NINETY PERCENT (95%) OF THE AMOUNT DUE THE CONTRACTOR ON ACCOUNT OF PROGRESS PAYMENTS, UNLESS OTHERWISE PROVIDED BY STATUTE OR AGREEMENT. THE REMAINING FIVE PERCENT (5%) SHALL CONSTITUTE "RETAINAGE." UPON FINAL COMPLETION, IN ACCORDANCE WITH STATE STATUTES THE OWNER SHALL PAY THE BALANCE OF THE RETAINAGE TO THE CONTRACTOR.

ADD NEW CLAUSE 9.3.2.1 IMMEDIATELY FOLLOWING SUBSECTION 9.3.2 TO READ AS FOLLOWS:

**"9.3.2.1. ACCOMPANYING EACH APPLICATION AND CERTIFICATE FOR PAYMENT UPON WHICH THE CONTRACTOR APPLIES FOR PAYMENT FOR MATERIALS NOT YET INCORPORATED INTO THE WORK, THE CONTRACTOR SHALL INCLUDE A STATEMENT AS FOLLOWS: "AT TIME OF PAYMENT, FOR VALUE RECEIVED, THE CONTRACTOR AND APPLICABLE SUBCONTRACTORS AND MATERIAL SUPPLIERS, JOINTLY AND SEVERALLY, HEREBY SELL, ASSIGN OR TRANSFER UNTO THE OWNER THE PROPERTY DESCRIBED AS STORED MATERIALS IN THIS APPLICATION AND CERTIFICATE FOR PAYMENT AND DO HEREBY WARRANT THE TITLE TO SAID PROPERTY, AND DO HEREBY CERTIFY THAT SAID PROPERTY IS FREE OF ALL LIENS AND ENCUMBRANCES." SHOULD THIS STATEMENT NOT BE INCLUDED WITH THE APPLICATION AND CERTIFICATE FOR PAYMENT, IT SHOULD BE INCLUDED BY REFERENCE WITH THE SAME FORCE AND EFFECT AS IF IT HAD BEEN WRITTEN THEREON."**

**CERTIFICATES FOR PAYMENT:**

**DELETE SECTION 9.4.1 AND SUBSTITUTE THE FOLLOWING SECTION 9.4.1:**

**"9.4.1. THE GENERAL CONTRACTOR WILL ASSEMBLE A PROJECT APPLICATION FOR PAYMENT BY COMBINING THE GENERAL CONTRACTOR'S APPLICATIONS WITH SIMILAR APPLICATIONS FOR PROGRESS PAYMENTS FROM SUB CONTRACTORS AND, AFTER CERTIFYING THE AMOUNTS DUE ON SUCH APPLICATIONS, FORWARD THEM TO THE ARCHITECT WITHIN SEVEN DAYS. THE OWNER RESERVES THE RIGHT TO DISAPPROVE ANY CERTIFICATE FOR PAYMENT IF OWNER HAS REJECTED THE WORK FOR WHICH THE CERTIFICATE FOR PAYMENT REPRESENTS, IN WHOLE OR IN PART. OWNER IS REQUIRED TO APPROVE ALL CERTIFICATES FOR PAYMENT PRIOR TO PAYMENT OF SAME."**

**DECISIONS TO WITHHOLD CERTIFICATION:**

**ADD THE FOLLOWING SENTENCE TO SECTION 9.5.1:**

**"THE FOREGOING IS SUBJECT TO THE RIGHTS OF THE OWNER TO APPROVE PAYMENTS TO GENERAL CONTRACTOR AS PROVIDED ELSEWHERE IN THIS AGREEMENT AND THE ARCHITECTURAL SERVICES AGREEMENT."**

**PROGRESS PAYMENTS:**

**ADD THE FOLLOWING PHRASE TO 9.6.4:**

**"BUT THE OWNER MAY MAKE DIRECT PAYMENTS TO SUBCONTRACTORS IF DEEMED APPROPRIATE BY OWNER TO PROTECT THE WORK AND OWNER'S INTERESTS."**

**DELETE SECTION 9.9.2 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 9.9.2:**

**"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."**

**ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY:**

**SAFETY OF PERSONS AND PROPERTY:**

**ADD THE FOLLOWING CLAUSE 10.2.4.1 TO SECTION 10.2.4:**

**"10.2.4.1 WHEN USE OR STORAGE OF EXPLOSIVES, OR OTHER HAZARDOUS MATERIALS, SUBSTANCES OR EQUIPMENT, OR UNUSUAL METHODS ARE NECESSARY FOR EXECUTION OF THE WORK, THE CONTRACTOR SHALL GIVE THE OWNER REASONABLE ADVANCE NOTICE."**

**ADD THE FOLLOWING CLAUSE 10.2.4.1 TO SECTION 10.2.4:**



**"10.2.4.1 IF THE CONTRACT DOCUMENTS REQUIRE THE CONTRACTOR TO HANDLE MATERIALS OR SUBSTANCES THAT UNDER CERTAIN CIRCUMSTANCES MAY BE DESIGNED AS HAZARDOUS, THE CONTRACTOR SHALL HANDLE SUCH MATERIALS IN AN APPROPRIATE MANNER AND IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL REGULATIONS."**

**ADD THE FOLLOWING PROVISIONS TO SECTION 10.2.5:**

**"THE EXCEPTION FOUND WITHIN THE PARENTHESES IN LINES ONE AND TWO OF THE SUBPARAGRAPH SHALL NOT APPLY TO DAMAGE AND LOSS CAUSED BY CONTRACTOR, ITS OWNERS, OFFICERS, DIRECTORS, AGENTS OR EMPLOYEES. OWNER MAY DEDUCT OR WITHHOLD FROM ANY PAYMENT TO THE CONTRACTOR UNDER THE CONTRACT DOCUMENTS FOR CONTRACTOR'S FAILURE, OR ANTICIPATED INABILITY, TO REMEDY ANY SUCH DAMAGE OR LOSS. THE FACT THAT SUCH DAMAGE OR LOSS MAY HAVE OCCURRED PRIOR TO A PAYMENT, WHICH WAS NOT DIMINISHED BY OWNER, SHALL NOT BE CONSIDERED A WAIVER OF OWNER'S RIGHT TO DEDUCT OR WITHHOLD PAYMENT FOR DAMAGE OR LOSS FROM ANY SUBSEQUENT PAYMENT."**

**EMERGENCIES:**

**DELETE SECTION 10.4 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 10.4.:**

**"10.4. IN AN EMERGENCY AFFECTING THE SAFETY OF PERSONS OR PROPERTY AT THE WORK SITE OR OFFSITE STORAGE, IF ANY, THE CONTRACTOR SHALL TAKE WHATEVER STEPS THE CONTRACTOR REASONABLY BELIEVES UNDER THE CIRCUMSTANCES WILL PREVENT OR LESSEN SUCH ANTICIPATED DAMAGE, INJURY OR LOSS. CONTRACTOR SHALL ACT WITH REASONABLE CARE IN LIGHT OF ALL THE CIRCUMSTANCES EXISTING AT THE TIME OF THE EMERGENCY. ADDITIONAL COMPENSATION OR EXTENSION OF TIME CLAIMED BY THE CONTRACTOR ON ACCOUNT OF AN EMERGENCY SHALL BE DETERMINED AS PROVIDED IN ARTICLE 7."**

**ARTICLE 11 – INSURANCE AND BONDS:**

**CONTRACTOR'S LIABILITY INSURANCE:**

**DELETE SECTION 11.1.2 AND SUBSTITUTE THE FOLLOWING MODIFIED SECTION 11.1.2 ALONG WITH THE FOLLOWING CLAUSES 1 THROUGH 9:**

**THE CONTRACTOR SHALL MAINTAIN SUCH INSURANCE, WHICH SHALL PROTECT HIM, THE OWNER AND THE ARCHITECT FROM CLAIMS UNDER:**

- 1. WORKER'S COMPENSATION                      STATUTORY LIMITS**
- 2. COMPREHENSIVE GENERAL LIABILITY      \$1,000,000 GENERAL AGGREGATE**
  - \$1,000,000 PRODUCTS- COMP/OP AGG**
  - \$ 500,000 PERSONAL & ADV INJURY**
  - \$ 500,000 EACH OCCURRENCE**
  - \$ 50,000 FIRE DAMAGE**
  - \$ 5,000 MED EXP**
  - \$1,000,000 COMBINED SINGLE LIMIT**
- 3. COMPREHENSIVE AUTOMOBILE LIABILITY \$1,000,000 COMBINED SINGLE LIMIT (ANY AUTO)**
- 4. THE POLICY MUST INCLUDE ALL OWNED, NON-OWNED, AND HIRED VEHICLE AND EQUIPMENT EXPOSURE.**
- 5. COMPLETED OPERATIONS LIABILITY: COVERAGE FOR HEREIN BEFORE SPECIFIED INSURANCE SHALL REMAIN IN FORCE FOR A PERIOD OF ONE YEAR AFTER COMPLETION AND ACCEPTANCE OF THE WORK.**

6. CONTRACTOR AND SUBCONTRACTOR'S INSURANCE MUST PROVIDE BLANKET CONTRACTUAL INSURANCE, PERSONAL INJURY INSURANCE; PROVIDE COVERAGE FOR EXPLOSION, COLLAPSE AND UNDERGROUND DAMAGE. IN ADDITION, THIRTY (30) DAYS NOTICE OF CANCELLATION MUST BE GIVEN TO THE OWNER AND ARCHITECT FOR ALL INSURANCE COVERAGE.

7. ALL CERTIFICATES OF INSURANCE MUST INDICATE THE NATURE AND EXTENT OF COVERAGE. CONTRACTOR SHALL PROVIDE COPIES OF ALL CERTIFICATES OF INSURANCE FOR ITSELF AND ITS SUBCONTRACTORS TO THE ARCHITECT BEFORE WORK IS COMMENCED BY THAT ENTITY.

8. THE CONTRACTOR SHALL EITHER: (1) REQUIRE EACH OF HIS SUBCONTRACTORS TO PROCURE AND MAINTAIN DURING THE TERM OF THIS SUBCONTRACT, SUBCONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE OF THE TYPE AND AMOUNTS AS REQUIRED BY THIS CONTRACT, OR (2) INSURE THE ACTIVITIES OF HIS SUBCONTRACTORS IN HIS OWN POLICY.

9. IF ANY SUBCONTRACTOR DOES NOT CARRY ALL FORMS OF INSURANCE LISTED OR COVERAGE IN THE AMOUNTS DESIGNATED, CONTRACTOR SHALL INFORM THE ARCHITECT. OWNER MAY MODIFY THESE REQUIREMENTS FOR SUBCONTRACTORS ON A CASE-BY-CASE BASIS."

**PROPERTY INSURANCE:**

ADD THE FOLLOWING SENTENCE TO SECTION 11.3.1.1:

"THE FORM OF POLICY SHALL BE 'COMPLETED VALUE'."

**ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK:**

**CORRECTION OF WORK:**

MODIFY SECTION 12.2.1 AS FOLLOWS:

AT THE END OF THE SECTION ADD THE FOLLOWING STATEMENT: "THE OWNER RESERVES THE RIGHT, IN ADDITION TO OTHER REMEDIES, TO WITHHOLD PAYMENT TO THE CONTRACTOR FOR ANY WORK REJECTED BY THE ARCHITECT OR OWNER FROM ANY PROGRESS OR FINAL PAYMENTS, AND RETAIN SUCH UNTIL THE WORK IS ACCEPTABLE."

MODIFY SECTION 12.2.3 AS FOLLOWS:

AFTER THE WORD "REMOVE" ON THE FIRST LINE OF THE SECTION ADD THE FOLLOWING WORDS "WITHOUT ADDITIONAL COMPENSATION."

ADD THE FOLLOWING MODIFIED SECTION 12.2.4:

IF THE CONTRACTOR FAILS TO CORRECT NON-CONFORMING WORK WITHIN A REASONABLE TIME, THE OWNER MAY CORRECT IT IN ACCORDANCE WITH PARAGRAPH 2.4. IF THE CONTRACTOR DOES NOT PROCEED WITH CORRECTION OF SUCH NON-CONFORMING WORK WITHIN A REASONABLE TIME FIXED BY WRITTEN NOTICE FROM THE ARCHITECT, THE OWNER MAY REMOVE THE NON-CONFORMING WORK AND STORE THE SALVAGEABLE MATERIALS OR EQUIPMENT AT THE CONTRACTOR'S EXPENSE, WITHOUT LIABILITY TO CONTRACTOR. IF THE CONTRACTOR DOES NOT PAY COSTS OF SUCH REMOVAL AND STORAGE WITHIN TEN (10) DAYS AFTER WRITTEN NOTICE, THE OWNER MAY, WITHOUT LIABILITY TO THE CONTRACTOR EXCEPT FOR ACCOUNTING FOR THE PROCEEDS THEREOF, DISPOSE OF SUCH EQUIPMENT BY SUCH MEANS AS OWNER DEEMS APPROPRIATE. OWNER SHALL ACCOUNT FOR THE PROCEEDS THEREOF, AND IF AFTER DEDUCTING COSTS AND DAMAGES THAT SHOULD HAVE BEEN BORNE BY THE CONTRACTOR, INCLUDING COMPENSATION FOR THE ARCHITECT'S AND OWNER'S SERVICES AND EXPENSES, INCLUDING ATTORNEY FEES MADE NECESSARY BY CONTRACTOR'S ACTIONS, THE PROCEEDS DO NOT COVER THE COSTS WHICH THE CONTRACTOR SHOULD HAVE BORNE, THE CONTRACT SUM SHALL BE REDUCED BY THE DEFICIENCY. IF THE PAYMENTS THEN AND THEREAFTER DUE THE CONTRACT ARE NOT SUFFICIENT TO COVER SUCH AMOUNT, THE CONTRACTOR SHALL PAY THE DIFFERENCE TO THE OWNER. IN THE EVENT THAT THE PROCEEDS EXCEED THE COSTS, SUCH EXCESS SHALL BE PAID TO THE CONTRACTOR."

#### **ARTICLE 13 – MISCELLANEOUS PROVISIONS:**

**ADD THE FOLLOWING SUBSECTION 13.1.1:**

**ALL CONTRACTORS AND SUBCONTRACTORS EMPLOYED UPON THE WORK SHALL CONFORM TO THE LABOR LAWS OF THE STATE IN WHICH THE PROJECT IS LOCATED AND THE VARIOUS ACTS AMENDATORY AND SUPPLEMENTARY THERETO; AND TO ALL OTHER LAWS, ORDINANCES AND LEGAL REQUIREMENTS APPLICABLE THERETO**

#### **TESTS AND INSPECTIONS:**

**ADD THE FOLLOWING SECTION 13.5.1 TO SECTION 13.5:**

**"13.5.1 IN THE EVENT THAT THE OWNER IS REQUIRED TO BRING AN ACTION TO ENFORCE ITS RIGHTS UNDER THE CONTRACT DOCUMENTS, OWNER SHALL ALSO BE ENTITLED TO RECOVER ITS COSTS INCLUDING ITS REASONABLE ATTORNEY'S AND ARCHITECT'S FEES."**

#### **ARTICLE 14 – TERMINATION OR SUSPENSION OF CONTRACT:**

##### **TERMINATION BY THE OWNER FOR CAUSE:**

**ADD NEW CLAUSE 14.2.1.5 TO SUBSECTION 14.2.1 IMMEDIATELY FOLLOWING CLAUSE 14.2.1.4 TO READ AS FOLLOWS:**

**"14.2.1.5 IS ADJUDGED BANKRUPT, OR IF HE MAKES A GENERAL ASSIGNMENT FOR THE BENEFIT OF HIS CREDITORS OR IF A RECEIVER IS APPOINTED ON ACCOUNT OF HIS INSOLVENCY."**

**ADD THE FOLLOWING SENTENCE TO SECTION 14.2.3: "THE CONTRACTOR IS NOT ENTITLED TO DAMAGES."**

**ADD THE FOLLOWING PROVISIONS TO SECTION 14.2.4:**

**"IN REGARD TO REASONS SET FORTH IN SECTION 14.2.1, IF THE COSTS OF FINISHING THE WORK EXCEED THE UNPAID BALANCE, THE CONTRACTOR SHALL PAY THE DIFFERENCE TO THE OWNER. IN THE EVENT THAT THE COSTS OF COMPLETION DO NOT EXCEED THE UNPAID BALANCE, CONTRACTOR SHALL BE PAID ONLY FOR THE WORK COMPLETED AND ACCEPTED BY OWNER AND ARCHITECT."**

**SUSPENSION BY THE OWNER FOR CONVENIENCE:**

**ADD THE FOLLOWING SECTION 14.3.3 TO SECTION 14.3:**

**"14.3.3 CONTRACTOR SHALL BE PAID FOR ALL WORK PERFORMED AT THE TIME NOTICE OF SUSPENSION WAS RECEIVED BY CONTRACTOR."**

**ARTICLE 15 – CLAIMS AND DISPUTES:**

**CLAIMS:**

**ADD THE FOLLOWING CLAUSE 15.1.5.1 TO SECTION 15.1.5:**

**"15.1.5.1. CLAIMS FOR INCREASE IN THE CONTRACT TIME SHALL SET FORTH IN DETAIL 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 PROVIDE SUCH SUPPORTING DOCUMENTATION AS THE OWNER MAY REQUIRE INCLUDING, WHERE APPROPRIATE, A REVISED CONSTRUCTION SCHEDULE INDICATING ALL THE ACTIVITIES AFFECTED BY THE CIRCUMSTANCES FORMING THE BASIS OF THE CLAIM."**

**ADD THE FOLLOWING CLAUSE 15.1.5.2 TO SECTION 15.1.5:**

**"15.1.5.2 THE CONTRACTOR SHALL NOT BE ENTITLED TO A SEPARATE INCREASE IN THE CONTRACT TIME FOR EACH ONE OF THE NUMBER CAUSES OF DELAY WHICH MAY HAVE CONCURRENT OR INTERRELATED EFFECTS ON THE PROGRESS OF THE WORK, OR FOR CONCURRENT DELAYS DUE TO THE FAULT OF THE CONTRACTOR."**

**END OF SECTION**

**SECTION 01 1000  
SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. The Project consists of the construction of a new Visitors concession stand with restrooms, fixed aluminum bleacher system and associated site improvements.

**1.02 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price.

**1.03 OWNER OCCUPANCY**

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

**1.04 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to areas noted on Drawings.
  - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law and by Owner:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

**END OF SECTION**

**SECTION 01 2500  
SUBSTITUTION PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- B. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

**1.03 DEFINITIONS**

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
    - a. Unavailability.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
    - a. Substitution requests offering advantages solely to the Contractor will not be considered.

**1.04 REFERENCE STANDARDS**

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase) Current Edition.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
  - 2. Agrees to provide the same warranty for the substitution as for the specified product.
  - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
  - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
  - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
  - 1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
- E. Limit each request to a single proposed substitution item.

### **3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT**

- A. Substitution requests will be accepted for review up to ten days prior to bid opening. Substitution requests received after that date will be returned with no action.
- B. Submittal Form (before award of contract):
  - 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

### **3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION**

- A. Submittal Form (after award of contract):
  - 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
  - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
  - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
  - 3. Bear the costs engendered by proposed substitution of:
    - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
- D. Substitutions will not be considered under one or more of the following circumstances:
  - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
  - 2. Without a separate written request.

### **3.04 RESOLUTION**

- A. Architect will notify Contractor in writing of decision to accept or reject request.

### **3.05 ACCEPTANCE**

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

### **3.06 CLOSEOUT ACTIVITIES**

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

### **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. Site mobilization meeting.
- E. Progress meetings.
- F. Construction progress schedule.
- G. Progress photographs.
- H. Coordination drawings.
- I. Submittals for review, information, and project closeout.
- J. Requests for Interpretation (RFI) procedures.
- K. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6000 - Product Requirements: General product requirements.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

**1.03 REFERENCE STANDARDS**

- A. AIA G716 - Request for Information 2004.
- B. AIA G810 - Transmittal Letter 2001.
- C. CSI/CSC Form 12.1A - Submittal Transmittal Current Edition.
- D. CSI/CSC Form 13.2A - Request for Information Current Edition.

**1.04 GENERAL ADMINISTRATIVE REQUIREMENTS**

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
  - 1. Requests for Interpretation (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. Correction Punch List and Final Correction Punch List for Substantial Completion.
  - 10. Closeout submittals.

**1.05 PROJECT COORDINATOR**

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for designated access, traffic, and parking facilities.



- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

## **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, MS Word, or MS Excel) 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. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
  - 2. Contractor and Architect are required to use this service.
  - 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 extra 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](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  - 6. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

### **3.02 PRECONSTRUCTION MEETING**

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
- C. Agenda:
  - 1. Distribution of Contract Documents.
  - 2. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  - 3. Designation of personnel representing the parties to Contract.
  - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 5. Scheduling.
- D. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

### **3.03 SITE MOBILIZATION MEETING**

- A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner's Representative..
  - 3. Architect.
  - 4. Special consultants.
  - 5. Contractor's superintendent.
  - 6. Major subcontractors.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements.
  - 3. Survey and building layout.
  - 4. Security and housekeeping procedures.
  - 5. Schedules.
  - 6. Application for payment procedures.
  - 7. Procedures for testing.
  - 8. Procedures for maintaining record documents.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.04 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals or as agreed during construction.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
  - 1. Contractor.
  - 2. Owner's representative
  - 3. Architect.
  - 4. Contractor's superintendent.
- 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 RFIs log and status of responses.
  - 7. Maintenance of progress schedule.
  - 8. Planned progress during succeeding work period.
  - 9. Effect of proposed changes on progress schedule and coordination.
  - 10. Other business relating to work.
- E. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

### **3.05 PROGRESS PHOTOGRAPHS**

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work.
- D. In addition to periodic, recurring views, take photographs of each of the following events:

1. Completion of site clearing.
2. Excavations in progress.
3. Foundations in progress and upon completion.
4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Final completion.

### **3.06 REQUESTS FOR INTERPRETATION (RFI)**

- A. Definition: A request seeking one of the following:
  1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
  2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    - b. Do not forward requests which solely require internal coordination between subcontractors.
  2. Prepare using software provided by the Electronic Document Submittal Service.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  1. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
    - a. Approval of submittals (use procedures specified elsewhere in this section).
    - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
    - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
    - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
  2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
  3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
  1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  2. Note dates of when each request is made, and when a response is received.
  3. Highlight items requiring priority or expedited response.
  4. Highlight items for which a timely response has not been received to date.
- F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
  1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

- G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  3. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.07 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. 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 INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
  2. Certificates.
  3. Test reports.
  4. Inspection reports.
  5. Manufacturer's instructions.
  6. Manufacturer's field reports.
  7. Other types indicated.

### **3.09 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
  2. Operation and maintenance data.
  3. Warranties.
  4. Bonds.
  5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### **3.10 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. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

### **3.11 SUBMITTAL PROCEDURES**

- A. General Requirements:
  - 1. Use a separate transmittal for each item.
  - 2. Transmit using approved form.
    - a. Use form generated by Electronic Document Submittal Service software.
  - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
  - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  - 5. 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.
  - 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  - 7. Provide space for Contractor and Architect review stamps.
  - 8. When revised for resubmission, identify all changes made since previous submission.
  - 9. 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.
  - 10. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
  - 1. Submit only information required by individual specification sections.
  - 2. Collect required information into a single submittal.
  - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
  - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
  - 2. Do not reproduce the Contract Documents to create shop drawings.
  - 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
  - 1. Transmit related items together as single package.
  - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

### **3.12 SUBMITTAL REVIEW**

- A. Submittals for Review: Architect will review each submittal, and mark appropriate action.
- B. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
  - 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- C. Architect's and consultants' actions on items submitted for information:
  - 1. Items for which no action was taken:
    - a. "Received" - to notify the Contractor that the submittal has been received for record only.
  - 2. Items for which action was taken:
    - a. "Reviewed" - no further action is required from Contractor.

**END OF SECTION**

**SECTION 01 3320  
ELECTRONIC DATA WAIVER, RELEASE AND INDEMNITY AGREEMENT**

February 9, 2023  
Will Rogers Stadium Visitor's Addition  
Tulsa Public Schools

ELECTRONIC DATA WAIVER,  
RELEASE AND INDEMNITY  
AGREEMENT  
01 3320  
1

Reed Architecture and Interiors  
18 East Hobson Avenue  
Sapulpa, Oklahoma

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NOW THEREFORE, ARCHITECT AND THE USER AGREE AS FOLLOWS:

**ACKNOWLEDGMENT AND LIMITATIONS:**

IT IS ACKNOWLEDGED THAT

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(2) THE ELECTRONIC DATA ARE NOT SUBSTITUTIONS FOR SAID INSTRUMENTS,

(3) DIFFERENCES MAY EXIST BETWEEN SAID INSTRUMENTS AND THE ELECTRONIC DATA WHICH ARCHITECT IS UNDER NO OBLIGATION TO DISCOVER OR DISCLOSE IF KNOWN,

(4) ELECTRONIC DATA MAY BE INCOMPATIBLE WITH THE USER'S SOFTWARE AND HARDWARE CONFIGURATIONS. IN ALL WAYS, INCLUDING THOSE ENUMERATED, USER ACCEPTS THE ELECTRONIC DATA "AS IS" AND ARCHITECT IS UNDER NO OBLIGATION TO CORRECT, UPDATE FOR CHANGES, ENHANCE OR MAINTAIN THE ELECTRONIC DATA FOR THE USER.

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**BUILDING INFORMATION MODELING (BIM):**

IT IS EXPRESSLY UNDERSTOOD THAT THE BIM FILES ARE BEING ISSUED ONLY AS SUPPLEMENTAL INFORMATION FOR CONVENIENCE TO THE CONTRACTOR. BIM FILES, LIKE ANY ELECTRONIC DATA, TRANSFERRED IN ANY MANNER OR TRANSLATED FROM THE SYSTEM AND FORMAT USED BY ALL OF THE DESIGN PROFESSIONALS ON THIS PROJECT ("DESIGN TEAM") TO ANOTHER SYSTEM OR FORMAT ARE SUBJECT TO ERRORS AND MODIFICATIONS THAT MAY AFFECT THE ACCURACY AND RELIABILITY OF THE DATA, AND, IN ADDITION, THAT ELECTRONIC DATA MAY BE ALTERED OR CORRUPTED WHETHER INADVERTENTLY OR OTHERWISE. AS A RESULT, NO REPRESENTATIONS OR WARRANTIES, WHETHER EXPRESSED OR IMPLIED, AS TO THE ACCURACY OF THE BIM FILES TRANSFERRED ARE MADE HEREIN. AS THE ACCURACY OF THE BIM FILES CANNOT BE WARRANTED OR GUARANTEED, IT IS ISSUED AS SUPPLEMENTAL INFORMATION ONLY AND MUST BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS, AND TO THE EXTENT THERE ARE ANY DISCREPANCIES BETWEEN THE BIM FILES AND THE CONTRACT DOCUMENTS, THE PHYSICAL CONTRACT DOCUMENTS MUST BE RELIED UPON.

February 9, 2023  
Will Rogers Stadium Visitor's Addition  
Tulsa Public Schools

ELECTRONIC DATA WAIVER,  
RELEASE AND INDEMNITY  
AGREEMENT  
01 3320  
2

Reed Architecture and Interiors  
18 East Hobson Avenue  
Sapulpa, Oklahoma

**BY SIGNING THE RELEASE BELOW YOU ARE ACKNOWLEDGING THAT:**

- 1) ("OWNER") AND THE DESIGN TEAM SHALL BE HELD HARMLESS FROM ANY AND ALL CLAIMS, LIABILITIES, DAMAGES, LOSSES, OR EXPENSES ARISING OUT THE CONTRACTOR'S USE OF THE BIM FILES AND CANNOT BE HELD RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WITHIN THE BIM FILES,**
- 2) THE BIM FILES ARE TO BE READ IN CONJUNCTION WITH ALL CONSTRUCTION DOCUMENTS, ADDENDA AND SUPPLEMENTAL CONTRACT DOCUMENTS, AND**
- 3) THE BIM FILES ARE NOT TO BE USED FOR FABRICATION OR CONSTRUCTION OF ANY KIND.**

**WAIVER AND RELEASE:**

**THE USER ACCEPTS ALL RISK OF INCOMPLETE, INACCURATE, DEFECTIVE AND VARIANT INFORMATION CONTAINED IN THE ELECTRONIC DATA, AND WAIVES, QUILTS, AND FOREVER DISCHARGES AND RELEASES ARCHITECT AND THEIR OFFICERS, DIRECTORS, EMPLOYEES AND SUCCESSORS FROM EVERY CLAIM ARISING OUT OF OR RELATED TO ANY ERROR, DISCREPANCY, INACCURACY, VARIATION OR OTHER DEFECT IN THE ELECTRONIC DATA, WHETHER OR NOT RESULTING IN WHOLE OR IN PART FROM AN ACT, ERROR OR OMISSION OF ARCHITECT AND WHETHER OR NOT SUCH CLAIM IS KNOWN OR UNKNOWN AS OF THE DATE OF THIS WAIVER AND RELEASE.**

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**INDEMNIFICATION:**

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**USER SHALL ATTACH A WRITTEN DESCRIPTION OF THIS AGREEMENT OUTLINING THE DATA REQUESTED INCLUDING SUCH INFORMATION AS SHEET NUMBER AND SHEET TITLE, AND A DESCRIPTION OF THE INTENDED USE OF THE DATA.**



USER'S ACCEPTANCE OF THESE TERMS, WHICH IS COMMUNICATED BY SIGNATURE OF THIS AGREEMENT, CONSTITUTES A WAIVER OF LIABILITY AND THE ACCEPTANCE OF RESPONSIBILITIES FOR THE COORDINATION OF ANY REVISIONS MADE TO THE INFORMATION TRANSMITTED. ACCEPTANCE OF THESE TERMS MAY HAVE LEGAL IMPLICATIONS AND SHOULD BE REVIEWED WITH USER'S LEGAL COUNSEL. ELECTRONIC DATA WILL NOT BE PROVIDED UNTIL ARCHITECT HAS RECEIVED A SIGNED AND DATED ORIGINAL OF THIS AGREEMENT.

SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

END OF SECTION

**SECTION 01 4000  
QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Mock-ups.
- G. Defect Assessment.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 3100 - Available Project Information: Soil investigation data.
- B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures.

**1.03 REFERENCE STANDARDS**

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants 2008 (Reapproved 2019).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.
- C. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Compliance with Contract Documents.
    - k. When requested by Architect, provide interpretation of results.
  - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities

specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### **1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

#### **1.06 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. Comply with 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. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- E. 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.

#### **1.07 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

### **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 MOCK-UPS**

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior stand alone mock-up as indicated on drawings or as directed by architect. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Work in Place Mock-ups. Architect may designate certain portions of work in place to serve as demonstration of aesthetics and workmanship. Approved Work in Place mock ups may remain in place.
- E. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.
- F. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be constructed.
- G. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- H. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- I. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- J. Accepted mock-ups shall be a comparison standard for the remaining Work.
- K. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

### **3.03 TESTING AND INSPECTION**

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  4. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

#### **3.04 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

**END OF SECTION**

**SECTION 01 4533**  
**CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.
- D. Manufacturers' field services.
- E. Fabricators' field services.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 3000 - Administrative Requirements: Submittal procedures.
- C. Section 01 4000 - Quality Requirements.
- D. Section 01 6000 - Product Requirements: Requirements for material and product quality.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. AHJ: Authority having jurisdiction.
- B. IAS: International Accreditation Service, Inc.
- C. NIST: National Institute of Standards and Technology.

**1.04 DEFINITIONS**

- A. Code or Building Code: ICC (IBC) 2018, Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): 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.
- C. Special Inspection:
  - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
  - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

**1.05 REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).
- B. AISC 341 - Seismic Provisions for Structural Steel Buildings 2016 (Revised 2020).
- C. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
- F. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field 2022.
- G. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete 2017.

- H. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2019.
- I. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.
- J. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2021.
- K. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members 2019.
- L. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members 2019.
- M. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems 2020a.
- N. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2020a.
- O. ASTM E2570/E2570M - Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage 2007 (Reapproved 2019).
- P. AWCI 117 - Technical Manual 12-B; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide 2014.
- Q. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
- R. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel 2018, with Errata (2022).
- S. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars 2018, with Amendment (2020).
- T. IAS AC89 - Accreditation Criteria for Testing Laboratories 2021.
- U. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291 2019.
- V. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- W. ICC (IBC)-2018 - International Building Code 2018.
- X. SDI (QA/QC) - Standard for Quality Control and Quality Assurance for Installation of Steel Deck 2017.
- Y. SJI 100 - Standard Specifications for K-Series, LH-Series, and DLH-Series Open Web Steel Joists, and for Joist Girders 2020.
- Z. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022.

## **1.06 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
  - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
  - 4. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.
- C. Manufacturer's Qualification Statement: Manufacturer is required to submit documentation of manufacturing capability and quality control procedures.

- D. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures.
- E. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of special inspection.
    - h. Date of special inspection.
    - i. Results of special inspection.
    - j. Compliance with Contract Documents.
  - 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
- F. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of fabricated item and specification section.
    - f. Location in the Project.
    - g. Results of special inspection.
    - h. Verification of fabrication and quality control procedures.
    - i. Compliance with Contract Documents.
    - j. Compliance with referenced standard(s).
- G. Test Reports: After each test or inspection, promptly submit at least four copies of report; one to Architect, one to contractor, one to owner and one to AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test or inspection.
    - h. Date of test or inspection.
    - i. Results of test or inspection.
    - j. Compliance with Contract Documents.
- H. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.
  - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.



### **1.07 SPECIAL INSPECTION AGENCY**

- A. Owner or Contractor will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

### **1.08 TESTING AND INSPECTION AGENCIES**

- A. Owner may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

### **1.09 QUALITY ASSURANCE**

- A. Special Inspection Agency Qualifications:
  - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
  - 2. Accredited by IAS according to IAS AC291.
- B. Testing Agency Qualifications:
  - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
  - 2. Accredited by IAS according to IAS AC89.
- C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL**

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
  - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

### **3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION**

- A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC).
- B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI (QA/QC).
- C. Open-Web Joists and Joist Girders: Comply with requirements of ICC (IBC), Table 1705.2.3.
  - 1. End Connections - Welding or Bolted: Comply with requirements of SJI 100; periodic.
  - 2. Bridging - Horizontal or Diagonal:
    - a. Standard Bridging: Comply with requirements of SJI 100; periodic.
    - b. Bridging That Differs From the SJI Specifications: Periodic inspection.
- D. Cold-Formed Steel Trusses Spanning 60 feet or Greater: Special Inspector is required to verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

### **3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION**

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved Contract Documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Bar Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, 26.6.4; periodic.
  - 1. Inspect all other welds; continuous.
- C. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ACI 318, Sections 8.1.3 and 21.2.8 prior to and during placement of concrete; continuous.
- D. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI 318.
  - 1. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.
- E. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 19, 16.4.3, 26.4.4; periodic.
- F. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 4 and 5.2; periodic.
- G. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M and ACI 318, Chapter 26.5, 26.12, and record the following, continuous:
  - 1. Slump.
  - 2. Air content.
  - 3. Temperature of concrete.
- H. Specified Curing Temperature and Techniques: Verify compliance with approved Contract Documents and ACI 318, Sections 5.11 through 5.13; periodic.
- I. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Chapter 26.11.1.2(b); periodic.
- J. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Section 6.1.1; periodic.
- K. Welding of Reinforcing Bars: Conduct special inspections and verify Special Inspector's qualifications in accordance with requirements of AWS D1.4/D1.4M.
- L. Materials: If the Contractor cannot provide sufficient data or documentary evidence that concrete materials comply with the quality standards of ACI 318, the AHJ will require testing of materials in accordance with the appropriate standards and criteria in ACI 318, Chapters 19 and 20.

### **3.04 SPECIAL INSPECTIONS FOR SOILS**

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
  - 1. Design bearing capacity of material below shallow foundations; periodic.
  - 2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
  - 3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
  - 4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
- B. Testing: Classify and test excavated material; periodic.

### **3.05 SPECIAL INSPECTIONS FOR CAST-IN-PLACE DEEP FOUNDATIONS**

- A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
  - 1. Element length; continuous.
  - 2. Element diameters and bell diameters; continuous.
  - 3. Embedment into bedrock; continuous.

4. End bearing strata capacity; continuous.
  5. Placement locations and plumbness; continuous.
  6. Type and size of hammer; continuous.
- B. Drilling Operations: Observe and maintain complete and accurate records for each element; continuous.
  - C. Material Volume: Record concrete and grout volumes.
  - D. Concrete Elements Associated with Cast-in-Place Deep Foundations: Perform additional inspections as required by the Special Inspections for Concrete Construction article of this section.

### **3.06 SPECIAL INSPECTIONS FOR EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)**

- A. Verify water resistive barrier coating applied over sheathing complies with ASTM E2570/E2570M.

### **3.07 SPECIAL INSPECTIONS FOR FIRE RESISTANT PENETRATIONS AND JOINTS**

- A. Verify penetration firestops in accordance with ASTM E2174.
- B. Verify fire resistant joints in accordance with ASTM E2393.

### **3.08 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE**

- A. Seismic Force-Resisting Systems: Comply with the quality assurance plan requirements of AISC 341.
- B. Cold Formed Steel Light Frame Construction:
  1. Field welding; periodic.
  2. Screw attachment, bolting, anchoring and other fastening of components within the main seismic force-resisting system; periodic.
- C. Architectural Components: Erection and fastening of components below; periodic.
  1. Exterior cladding.
  2. Interior and exterior veneer.
  3. Interior and exterior non-loadbearing walls and partitions.
- D. Mechanical and Electrical Components:
  1. Anchorage of electric equipment required for emergency or standby power systems; periodic.
  2. Installation and anchorage of other electrical equipment; periodic.
- E. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.
- F. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

### **3.09 SPECIAL INSPECTIONS FOR WIND RESISTANCE**

- A. Cold-Formed Steel Light Frame Construction:
  1. Field welding; periodic.
  2. Screw attachment, bolting, anchoring and other fastening of components within the main wind force-resisting system; periodic
- B. Wind Resisting Components:
  1. Roof covering, roof deck, and floor framing connections; periodic.
  2. Exterior wall covering and wall connections to roof and floor diaphragms and framing; periodic.
- C. Structural Observations for Wind Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

### **3.10 OTHER SPECIAL INSPECTIONS**

- A. Provide for special inspection of work that is required by AHJ.

- B. Alternative Test Procedures: Where approved rules and standards do not exist, test materials and assemblies as required by AHJ or provide AHJ with documentation of quality and manner in which those materials and assemblies are used.

### **3.11 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES**

- A. Special Inspection Agency shall:
  - 1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified reference standards.
  - 4. Ascertain compliance of materials and products with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Submit reports of all tests or inspections specified.
- B. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- C. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

### **3.12 TESTING AGENCY DUTIES AND RESPONSIBILITIES**

- A. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
  - 5. Perform additional tests and inspections required by Architect.
  - 6. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

### **3.13 CONTRACTOR DUTIES AND RESPONSIBILITIES**

- A. Contractor Responsibilities, General:
  - 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
  - 2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site and to the work.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to work to be tested or inspected.

- b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
  - c. To facilitate tests or inspections.
  - d. To provide storage and curing of test samples.
- 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
- 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- B. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- C. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

### **3.14 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES**

- A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### **END OF SECTION**

**SECTION 01 5000  
TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

**1.02 TEMPORARY UTILITIES**

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

**1.03 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
  - 2. Internet Connections: Minimum of one; DSL modem or faster.
  - 3. Email: Account/address reserved for project use.

**1.04 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

**1.05 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and walkways required by governing authorities for public rights-of-way.
- 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. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Coordinate location with Owner..

**1.07 EXTERIOR ENCLOSURES**

- A. Provide temporary insulated 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.

- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

#### **1.08 SECURITY**

- A. Provide security and facilities to protect Work, 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. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

#### **1.10 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### **1.11 PROJECT IDENTIFICATION**

- A. Provide project identification sign.
- B. Erect on site as directed by Architect and Owner.
- C. No other signs are allowed without Owner permission except those required by law.

#### **1.12 FIELD OFFICES**

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

#### **1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION - NOT USED**

### **END OF SECTION**

**SECTION 01 6000  
PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 4000 - Quality Requirements: Product quality monitoring.
- C. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

**1.03 SUBMITTALS**

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

**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.

**2.02 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Where other criteria are met, Contractor shall give preference to products that:
  - 1. If used on interior, have lower emissions.
  - 2. Are extracted, harvested, and/or manufactured closer to the location of the project.
  - 3. Have longer documented life span under normal use.
  - 4. Result in less construction waste.
  - 5. Are made of recycled materials.

**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: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. 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; obtain receipt prior to final payment.

### **PART 3 EXECUTION**

#### **3.01 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.

#### **3.02 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. Transport and handle products in accordance with manufacturer's instructions.

#### **3.03 STORAGE AND PROTECTION**

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- D. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- F. Prevent contact with material that may cause corrosion, discoloration, or staining.

**END OF SECTION**

**SECTION 01 7000  
EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pre-installation meetings.
- B. Starting of systems and equipment.
- C. Demonstration and instruction of Owner personnel.
- D. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- E. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

**1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

**1.04 QUALIFICATIONS**

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located 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,

**1.05 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Perform dewatering activities, as required, for the duration of the project.
- D. 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.
- E. 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.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

**1.06 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.
- 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, 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 NOT USED.**

## **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. Examine and verify specific conditions described in individual specification sections.
- C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

### **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, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Notify Architect four days in advance of meeting date.

### **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. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- E. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

### **3.05 GENERAL INSTALLATION REQUIREMENTS**

- A. 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.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.06 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.07 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.

### **3.08 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. 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.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### **3.09 DEMONSTRATION AND INSTRUCTION**

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

### **3.10 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.11 FINAL CLEANING**

- A. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft

surfaces.

- B. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Clean filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and elsewhere as required..
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.12 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and Owner.
- B. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- C. Architect will not commence Substantial Completion Inspection until all requirements listed in paragraph B above are complete.
- D. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- G. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### **3.13 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.

**END OF SECTION**

**SECTION 01 7800  
CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, samples and all test results.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. These include "as-built" drawings and specifications.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to 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. Change Orders and other modifications to the Contract.
  - 5. All required testing results.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Product substitutions or alternates utilized.
  - 2. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
  - 1. Field changes of dimension and detail.
  - 2. 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.

### **3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Complete nomenclature and model number of replaceable parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Additional Requirements including testing: As specified in individual product specification sections.

### **3.04 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 plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- E. 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.
- F. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

### **3.05 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

**END OF SECTION**



**SECTION 01 7900  
DEMONSTRATION AND TRAINING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Training of Owner personnel in operation and maintenance is required for:
  - 1. All software-operated systems.
  - 2. HVAC systems and equipment.
  - 3. Plumbing equipment.
  - 4. Electrical systems and equipment.
  - 5. Landscape irrigation.
  - 6. Items specified in individual product Sections.
- B. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
  - 1. 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.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 TRAINING - GENERAL**

- A. Conduct training on-site unless otherwise indicated.
- B. 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.
- C. 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. Discuss common troubleshooting problems and solutions.
  - 6. Discuss any peculiarities of equipment installation or operation.
  - 7. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
  - 8. Review spare parts suppliers and sources and procurement procedures.

**END OF SECTION**

## **SECTION 02 4100 DEMOLITION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.
- B. Abandonment and removal of existing utilities and utility structures.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- D. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

#### **1.03 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: Company specializing in the type of work required.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Fill Material: As noted on contract drawings and project Geo-Tech report..

### **PART 3 EXECUTION**

#### **3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Use of explosives is not permitted.
  - 3. Provide, erect, and maintain temporary barriers and security devices.
  - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 5. Do not close or obstruct roadways or sidewalks without permit.
  - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Protect existing structures and other elements that are not to be removed.
- C. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

#### **3.02 EXISTING UTILITIES**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

### **3.03 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**SECTION 03 3000  
CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes cast-in-place concrete and supplementary items necessary to complete work required for their installation.
- B. Related Sections:
  - 1. Division 03 Section "Concrete Forming".
  - 2. Division 03 Section "Concrete Accessories" for items including but not limited to inserts, waterstops, expansion anchors, and adhesive anchors.
  - 3. Division 03 Section "Concrete Reinforcement".
  - 4. Division 03 Section "Concrete Finishing" for items including but not limited to tolerances, curing, protection, and surface repairs.
  - 5. Division 07 Section "Below Slab Vapor Retarder".
  - 6. Division 32 Sections for concrete paving and walks.

**1.2 SUBMITTALS**

- A. Laboratory Test Reports for Concrete Materials and Mix Designs: As specified herein and in accordance with Division 01 Sections "Quality Assurance" and "Quality Control".
- B. Material Certificates: As specified herein when required. Certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturer that chloride content complies with specification requirements, and admixture is compatible with other required or proposed admixtures.
- C. Sleeve Locations: Submit plan showing proposed sleeve dimensioned locations and sizes for review by Architect and Engineer prior to concrete placement.

**1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete".
  - 2. ACI 318, "Building Code Requirements for Structural Concrete".
  - 3. ACI 306.1, "Std. Specification for Cold Weather Concreting".
  - 4. ACI 117, "Std. Specifications for Tolerances for Concrete Construction and Materials".
  - 5. Concrete Reinforcing Steel Institute (CRSI), "Manual of Std. Practice".
  - 6. ASTM E 1155, "Std. Test Method for Determining Floor Flatness and Levelness Using F-Number System".

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7. ACI 503.1, "Std. Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with Multi-Component Epoxy Adhesive".
  8. ACI 503.2, "Standard Specification for Bonding Plastic Concrete to Hardened Concrete with Multi-Component Epoxy Adhesive".
    - a. Paragraph 2.3.7.1 of above code is hereby replaced in its entirety with following:
      - 1) Independent Testing Laboratory approved by Architect/Engineer shall evaluate bonding of fresh concrete to existing concrete after fresh concrete has cured for not less than 28 days. Written report prepared by Independent Testing Laboratory shall be submitted to Architect/Engineer for review.
- B. Document Conflict and Priority: In case of concrete work conflict between documents, including drawings and specifications, notify Architect prior to submitting proposal. Most stringent criteria shall govern and be given priority, unless otherwise indicated by Architect in writing.
- C. Compatibility of Concrete Admixtures and Surface Treatments: Contractor shall be responsible for selection of admixtures and surface treatments compatible with one another and with specified requirements of concrete work including final surface treatments. Contractor shall be responsible for following product manufacturer's instructions for use, limitations, and precautions.
- D. Concrete Plant Certification and Qualifications: Certified in accordance with National Ready Mixed Concrete Association (NRMCA) Plant Certification Checklist. Minimum of 5 years successful experience in manufacturing ready-mixed concrete complying with ASTM C94 requirements for facilities and equipment.
- E. Concrete Contractor Qualifications: Minimum of 5 years successful experience with installation and finishing of concrete similar in materials, system, and project scope to that indicated for this Project.
- F. Concrete Testing Service: Engage testing service acceptable to Architect to perform material evaluation tests and to design concrete mixes.
- G. Testing/Retesting of Materials and Installed Work: May be required at any time during progress of Work as directed by Architect. Such tests/retests, not indicated to be performed at Owner's expense, will be at Contractor's expense.
- H. Concrete Pre-construction Conference:
1. At least 15 days prior to start of concrete construction, Contractor shall hold meeting to review detailed requirements of concrete mix designs and to determine procedures for producing proper concrete construction. Additionally, review requirements for submittals, Status of Coordinating Work, availability of materials and procedures for materials inspection, testing, certifications, and floor flatness/levelness. At minimum, discuss following items as pertains to project.
    - a. Requirements for submittals.
    - b. Status of Coordinating Work.
    - c. Availability of materials and procedures for materials inspection.
    - d. Testing.
    - e. Certifications.
    - f. Floor flatness/levelness.

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- g. Curing and finishing of floor surfaces.
  - h. Control of concrete moisture/wetness and the affects of moisture vapor transmission (MVT) on finish flooring materials.
- 2. Contractor shall require responsible representatives of every party who is concerned with concrete work to attend conference, including but not limited to following:
  - a. Contractor's superintendent.
  - b. Contractor's Laboratory responsible for concrete mix design(s).
  - c. Owner's Laboratory responsible for field quality control.
  - d. Concrete subcontractor.
  - e. Ready-mix concrete producer.
  - f. Admixture manufacturer.
  - g. Concrete pumping subcontractor.
  - h. Owner's and Architect's/Engineer's representative.
  - i. Floor Consultant and Floor Flatness Inspector.
  - j. Finish flooring subcontractor(s).
- 3. Minutes of meeting shall be recorded, typed and printed by Contractor and distributed by him to parties concerned within 5 days of meeting. One copy of minutes shall also be transmitted to following for information purposes.
  - a. Owner's representative.
  - b. Architect.
  - c. Engineer of record.
  - d. Floor Consultant.
  - e. Owner's Laboratory responsible for field quality control.
- 4. Engineer will be present at conference. Contractor shall notify Engineer at least 7 days prior to scheduled date of conference.

#### 1.4 TOLERANCES

- A. Tolerances for Concrete Construction and Materials shall conform to requirements of ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials, except as modified by requirements of these Contract Documents.
- B. Floor finish tolerances for surfaces designated to receive troweled finish shall be measured in accordance with ACI 117, Section 4.5.6, except as modified by these Contract Documents. Refer to Division 03 Section "Concrete Finishing" for Flatness and Levelness Inspection and finished surface F-number requirements.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Engineer, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

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## 2.2 MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III.
- B. Portland Cement at Concrete Exposed to Sulfates:
  - 1. Moderate Sulfate Exposure: ASTM C 150, Type II.
  - 2. Severe Sulfate Exposure: ASTM C 150, Type V.
- C. Supplementary Cementitious Materials
  - 1. Fly Ash: ASTM C 618, Class C or F.
  - 2. Ground Granulated Blast-Furnace Slag (GGBFS): ASTM C 989, Grade 100 or 120.
  - 3. Silica Fume: ASTM C 1240, Amorphous Silica.
- D. Blended Hydraulic Cements: ASTM C 595, Type "IP", or Type "IS".
- E. Fine Aggregate: ASTM C 33, natural sand, manufactured sand, or combination thereof, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, and shall be so graded from coarse to fine as to produce minimum percentage of voids.
- F. Coarse Aggregate:
  - 1. Normal Weight Aggregate: ASTM C 33, gravel or crushed stone suitably washed and screened, and shall consist of hard, durable particles without adherent coatings.
  - 2. Lightweight Aggregate: ASTM C 330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.
- G. Water: ASTM C 94, paragraph 4.1.3.
  - 1. Free of foreign matter that may be harmful to concrete, reinforcement, or concrete accessories, including but not limited to oils, acids, alkalies, salts, and organic materials.
  - 2. Free of deleterious amounts of chloride ions.
- H. Admixtures:
  - 1. General: Calcium chloride, thiocyanates, or admixtures with more than 0.05 percent chloride ions are not permitted.
  - 2. Specific admixtures, or manufacturer listed under each item below is "acceptable" only if manufacturer can evidence product compatibility with other products comprising concrete mix.
  - 3. Air-Entraining Admixture: ASTM C 260
    - a. Provide air entraining agent in sufficient quantity to assure controlled entrainment within specified percentage limits required herein.
    - b. Manufacturers and Products:
      - 1) BASF; MB-VR Standard or Micro Air
      - 2) Euclid Chemical Company; Air-Mix or AEA 92

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- 3) Grace Construction Products; Darex AEA or Daravair
  - 4) Sika Corporation; AER
4. Water-Reducing Admixture: ASTM C 494, Type A.
  - a. Certified by manufacturer as Lignin-Free.
  - b. Manufacturers and Products:
    - 1) BASF; Pozzolith 200N or Pozzolith 322N
    - 2) Euclid Chemical Company; Eucon WR-75 or WR91
    - 3) Grace Construction Products; WRDA or Daracem
    - 4) Sika Corporation; Plastocrete 161
5. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G.
  - a. Manufacturers and Products:
    - 1) BASF; Rheobuild 1000
    - 2) Euclid Chemical Company; Eucon 37
    - 3) Grace Construction Products; Daracem 100
    - 4) Sika Corporation; Sikament 300
6. Water-Reducing Accelerating Admixture: ASTM C 494, Type E.
  - a. Non-corrosive, non-chloride.
  - b. Manufacturers and Products:
    - 1) BASF; Pozzutec 20
    - 2) Euclid Chemical Company; Accelguard 80
    - 3) Sika Corporation; Plastocrete 161FL
7. Water-Reducing Retarding Admixture: ASTM C 494, Type D.
  - a. Manufacturers and Products:
    - 1) Euclid Chemical Company; Eucon Retarder-75
    - 2) Grace Construction Products; Daratard-17
    - 3) BASF; Pozzolith R
    - 4) Sika Corporation; Plastocrete 161MR or Plastiment
8. Shrinkage-Reducing Admixture: Admixture which reduces concrete drying shrinkage by reduction of capillary tension of pore water.
  - a. Non-corrosive, non-chloride.
  - b. Consult with admixture manufacturers when used with air-entrained concrete mixes.
  - c. Manufacturers and Products:
    - 1) BASF; Tetraguard AS20 (at non-air-entrained concrete only)
    - 2) Grace Construction Products ; Eclipse (at non-air-entrained concrete only)
    - 3) Grace Construction Products; Eclipse Plus (at air-entrained concrete only)

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I. Chloride Ion Content:

1. Limit water soluble chloride ion concentrations in hardened concrete, at ages from 28 to 42 days, from ingredients including water, aggregates, cementitious materials, and admixtures as indicated by Table 4.4.1, ACI 318.
2. Consider concrete placed on metal deck to be within same category as prestressed concrete in Table 4.4.1, ACI 318, regarding maximum chloride ion concentrations in hardened concrete.
3. Provide certification for each mix design that chloride ion content does not exceed specified limits when tested in accordance with ASTM C 1218.

2.3 RELATED MATERIALS

A. Bonding Compounds: Use in strict conformance with manufacturer's written recommended application limitations, precautions, and directions for use, including, but not limited to, surface preparation, mixing, placing, curing, and compatibility with substrate conditions.

1. Latex Bonding Agents, Admixtures, and Adhesives: ASTM C 1059, Type II.
  - a. Acceptable at non-structural and structural bonding applications, interior or exterior, unless noted otherwise in Contract Documents.
  - b. Use only acrylic or styrene butadiene latex based adhesives.
  - c. Manufacturers and Products:
    - 1) Euclid Chemical Company; SBR Latex
    - 2) L & M Construction Chemicals; Everbond
    - 3) W.R. Meadows, Inc.; ACRY-LOK
2. Polyvinyl Acetate Bonding Agents: ASTM C 1059, Type I
  - a. Acceptable at non-structural and structural bonding applications, interior surfaces not subject to water exposure or high humidity during construction or in-service.
  - b. Manufacturers and Products:
    - 1) Euclid Chemical Company; Euco Weld
    - 2) L & M Construction Chemicals; Everweld
    - 3) W.R. Meadows, Inc.; Intralok
3. Epoxy-Resin Bonding Adhesives: ASTM C 881, Types I, II, IV, and V.
  - a. Types I and II: Acceptable at non-structural bonding applications.
  - b. Types IV and V: Acceptable at structural load-bearing bonding applications.
  - c. Suitable for use on dry or damp surfaces.
  - d. Epoxy Adhesive for Bonding Plastic Concrete to Hardened Concrete: Conform to requirements of ACI 503.2-92 (R97), unless modified herein.
  - e. Epoxy Adhesive for Bonding Hardened Concrete, Steel, Wood, Brick, and other Materials to Hardened Concrete: Conform to requirements of ACI 503.1-92 (R97), unless modified herein.

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- f. Manufacturers (Consult with supplier for specific product and compatibility with substrate conditions. Subject to Engineer's review and approval):
  - 1) BASF
  - 2) Euclid Chemical Company
  - 3) Sika Corporation
  - 4) W.R. Meadows

B. Overlay and Repair Mortar: Use of overlay and repair mortar shall be in accordance with manufacturer's application limitations, precautions, and directions for use, including but not limited to surface preparation, mixing, placing, curing, and compatibility with substrate conditions.

1. Epoxy Mortar: ASTM C 881, Types I, and IV.

- a. Acceptable at interior applications only, unless otherwise directed by Engineer.
- b. Appropriate applications include locations susceptible to high wear or high corrosion.
- c. Type I: Acceptable at non-structural applications.
- d. Type IV: Acceptable at structural applications.
- e. Manufacturers (Consult with supplier for specific product and compatibility with substrate conditions. Subject to Engineer's review and approval):

- 1) BASF
- 2) Euclid Chemical Company
- 3) Sika Corporation

2. Polymer Modified Cementitious Mortar: ASTM C 1059, Type II:

- a. Acceptable at structural and non-structural applications, interior or exterior.
- b. Manufacturers (Consult with supplier for specific product and compatibility with substrate conditions. Subject to Engineer's review and approval):

- 1) BASF
- 2) Euclid Chemical Company
- 3) Sika Corporation

C. Self-Leveling Underlayment Compound: Specified in Division 03 Section "Concrete Finishing".

## 2.4 PROPORTIONING AND DESIGNING MIXES

- A. Types of concrete, minimum 28-day compressive strength (f'c), and maximum nominal coarse aggregate sizes are shown in drawings.
- B. Prepare design mixes for each type and strength of concrete by either field experience methods or by laboratory trial batch methods. Mix design testing shall be furnished by Contractor. Selection of concrete proportions for each mix shall be certified by an Independent Testing Laboratory hired by Contractor.

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- C. Field Experience Method: Provide prior established mix designs proportioned in accordance with ACI 211, accompanied by test data indicating acceptable strength history in accordance with ACI 318, part 5.3, unless otherwise modified herein. Data shall be certified by Independent Testing Laboratory.
1. Temperature of concrete in test data shall be within 5 degrees F. of maximum temperature specified for this project.
  2. Strength of concrete used in supporting test data shall vary no more than plus 1000 psi or minus 500 psi from that specified for this project.
  3. Shrinkage limits for each mix proposed for walls and horizontal surfaces shall be as specified by D.5.d. below. Proof of meeting shrinkage limits shall accompany mix designs.
- D. Laboratory Trial Batch Method: Establish proportions in accordance with ACI 211, and ACI 318 paragraph 5.3.3.2, unless otherwise modified herein.
1. Test cylinders at seven days and at twenty-eight days in accordance with ASTM C 39.
  2. Where required design strength is 6,000 psi or greater, test additional set of cylinders at fifty-six days.
  3. Temperature of concrete used in trial batches shall be maximum temperature specified herein.
  4. Cement content and mix proportions used shall be such that this water-cement ratio is not exceeded when slump is maximum permitted. Control in field shall be based upon maintenance of proper cement content, water-cement ratio, slump, and air content.
- E. Mix Design Information: Include following as part of mix design submittals:
1. Project identification name.
  2. Specific location, member, etc....for mix usage. Affix code, mix design number, or other specific identification symbol to each mix design.
  3. Type of concrete, i.e....normal weight, lightweight, etc....
  4. Dry unit weight, (pcf).
  5. Aggregate type, gradation, and source.
  6. Admixture types, product identification, and supplier. Include manufacturer's literature for each admixture.
  7. Cement type and brand, including fly ash [and micro silica fume] when applicable.
  8. Placement method intended.
  9. Other characteristics including, but not limited to, 28-day compressive strength, slump, W/C ratio, and proportions of each material in mix.
  10. 28-day shrinkage data for concrete at walls and horizontal surfaces.
- F. Water-to-Cement Ratio (W/C):
1. Water content and W/C ratio shall be lowest possible value consistent with maximum consolidation, workability, and density.
  2. Intent of this specification is to achieve low porosity concrete, minimize shrinkage, and to minimize cracking, thus minimizing harmful moisture or ion penetrations, and thereby protecting reinforcement.

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3. Maximum W/C ratios for following normal weight concrete classes are as follows, unless otherwise noted herein:

f'c at 28-days (psi)	Concrete Type	
	Air-entrained	Non-Air-entrained
3,000	0.50	0.55
3,500	0.45	0.45
4,000 & above	0.40	0.45

4. Maximum W/C ratio for building retaining walls with habitable space below grade (basement walls) shall conform to note F.3. above, but in no case greater than 0.48.
5. Severe Exposure: Maximum W/C ratio at concrete subject to "severe exposure" shall be 0.40. Following locations are hereby classified as "severe exposure" conditions:
- Garage Topping Slabs and Topping Slabs.
  - Truck Dock Slab.
  - Basin Walls, Slabs, and Pit Walls at Cooling Tower.

G. Supplementary Cementitious Materials:

- Use supplementary cementitious materials described below to improve consistency, placement, finishing, and economics. Use is at Contractor's option, unless otherwise indicated.
- Mixes with higher percentage than specified below for supplementary cementitious materials may be proposed by Contractor, but are subject to Engineer's approval and limitations herein. If proposed, include following as minimum for consideration:
  - Total cost savings to be realized.
  - Previous experience of satisfactory performance, using materials from identical sources as proposed for this project.
  - Affect, if any, on concrete finishing.
  - Affect, if any, on air-entrainment.
  - Affect, if any, on concrete shrinkage properties.
  - Amount of water content change.
  - Any other comments based on Contractor's and concrete supplier's experience supportive of proposed percentage increase.
- Do not exceed specified percentage limits for concrete subject to exposure to de-icing chemicals.
- When supplementary cementitious materials are used in mixes, it shall be understood that time required for setting and strength gain may be longer than required for similar mix with Portland Cement only, therefore precautions to avoid premature finishing shall be considered and undertaken.
- Limits below represent percentage of total cementitious material in mix, by weight.
- Fly Ash: 25 percent.
- Ground Granulated Blast-Furnace Slag (GGBFS): 50 percent, except as follows. If used in hydraulic blend with other supplementary cementitious materials, reduce GGBFS percentage such that sum of supplementary cementitious materials does not exceed 50 percent of total cementitious materials, by weight.

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8. Silica Fume: 10 percent.

H. Slump Limits: Proportion and design mixes to limit concrete slump at point of deposit as follows:

- |    |  |  |
|----|--|--|
| 1. | Concrete, unless noted otherwise                       | 5" max., 2" min.                         |
| 2. | Basement Walls, Footings                               | 4" max., 1" min.                         |
| 3. | Elevated Slabs, Slabs-on-grade,<br>Slabs-on-metal deck | 4" max., 1" min.                         |
| 4. | Pier Concrete  | Flowable Conc. req'd. (see below)        |
| 5. | Lightweight Concrete                                   | 4" max., 1" min.                         |
| 6. | Flowable Concrete                                      | 8" max. after add'n of superplasticizer. |
|    | (Concrete with Superplasticizer)                       | 3" max. slump prior to addition.         |

I. Admixtures:

1. Use approved WATER-REDUCING ADMIXTURE conforming to ASTM C 494, Type A, D, E, F, or G in concrete, unless otherwise noted herein.
2. Use approved SUPERPLASTICIZER where Flowable Concrete is specifically indicated and as required to improve placement and workability; to lower W/C ratio; or for shrinkage or permeability reduction.
3. Use high-range, water reducing admixture in concrete with a water/cement ratio of 0.42 and less.
4. Use approved AIR-ENTRAINING ADMIXTURE as follows:
  - a. Normalweight concrete exposed to weather. Air content percent per ACI 318, Table 4.2.1, (exposure as follows) unless noted otherwise herein. Reduce air content percent indicated by 1 percent where concrete 28-day f'c is greater than 5,000 psi.
  - b. Lightweight Concrete Mixes: Air content percent as recommended by concrete supplier, but, not less than 4 percent.
  - c. Provide air content percent in accordance with ACI 318, Table 4.2.1, (exposure as follows) unless noted otherwise herein.
  - d. Reduce air content percent for normalweight concrete at unformed surfaces scheduled to receive troweled finish or dry shake hardeners to 3 percent.
5. Use admixtures in compliance with manufacturer's directions. Control dosage rates. Do not overdose mixes.

J. Cement Content:

1. Minimum cement content of concrete mixes to be placed where severe exposure conditions exist or exposure to deicing chemicals will occur shall be 520 lbs. per cu. yd. meeting ASTM C 150 or C 595.
2. Parking Garage Structure: Provide minimum cement content in parking garage slab and beam mixes.

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- K. Non-Shrink Grout: Material shall be ready-to-use non-metallic or metallic aggregate product requiring only addition of water at jobsite and shall produce flowable cementitious grouting material having no drying shrinkage at any age. Material shall conform to requirements of ASTM C 1107.
1. Use non-metallic grout for exposed conditions, unless indicated otherwise.
  2. Compressive strength at 7 days: 6,000 psi minimum.
  3. Compressive strength at 28 days: 8,000 psi minimum.
  4. Subject to compliance with requirements, acceptable non-shrink grouts are as follows:
    - a. BASF; Masterflow 928 Grout
    - b. Euclid Chemical Company; Euco N-S
    - c. W.R. Meadows, Inc.; 588 Precision Grout

### PART 3 - EXECUTION

#### 3.1 GENERAL

A. Coordination with Other Products/Trades:

1. Give various trades and subcontractors ample notification and opportunity to furnish anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frames, vents, wires, supports, or other items required to be built into concrete by provisions of Drawings or of Specifications governing work of those trades and subcontractors, or as may be necessary for proper execution of their work.
2. Obtain suitable templates or instructions for installation of those items which are required to be placed in forms.

B. Concrete Characteristics:

1. Slump: Concrete shall not be placed when its plasticity, as measured by slump tests, is outside limits specified.
2. Classes: Concrete of several classes required shall have characteristics shown on Drawings or as specified herein.

C. Mixing: Batch, mix, and transport ready-mixed concrete in accordance with the requirements of ASTM C 94. Concrete shall not be transported or used after period in excess of 90 minutes has elapsed after introduction of water into mixer. When concrete temperature exceeds 86 degrees F, time shall be reduced to 45 minutes. Agency supplying ready-mixed concrete shall have plant of sufficient capacity, and adequate transportation facilities, to assure continuous delivery at rate required. Plant equipment and facilities shall conform to "Certification of Ready Mixed Concrete Production Facilities (Checklist with Instructions)" of National Ready Mixed Concrete Association. Frequency of deliveries to site of work must be so as to provide for placing concrete continuously throughout one (1) pour.

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- D. Conveying Concrete: Convey concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Concrete to be conveyed by pumping will require approval of Architect for each class of concrete specified before being used.
1. Equipment for chuting, pumping, and pneumatically conveying concrete shall be of size and design as to assure practically continuous flow of concrete at delivery end without separation of materials.
  2. Use of gravity flow or aluminum chutes or conveyors for transporting concrete horizontally is not permitted.
- E. Control of Water: Control water at all times during mixing, placing, finishing, curing, and after completion of curing phase. Excess water during mixing and placing phases effects properties of concrete, including but not limited to strength, shrinkage/cracking, set time, and long-term durability. Excess water after curing phase effects drying of hardened concrete with direct affect on application of finish materials applied with adhesives sensitive to moisture and/or water vapor. Control of water includes water at place of mixing, truck water, water at jobsite, and moisture due to rain, ice, or snow. Contractor is responsible for control of water and affects on concrete and material(s) to be applied to hardened concrete.

### 3.2 JOINTS

- A. General: Locate joints as indicated on Drawings or, if not shown, at locations approved by Architect/Engineer. Intent of this Specification is to locate joints so as not to adversely affect either structural integrity or appearance of structure, and to control cracking.
- B. Construction Joints: Place construction joints perpendicular to main reinforcement. Locate joints within middle third of span and continue reinforcement across construction joint unless otherwise indicated by Drawings. Provide dowels across construction joints as indicated by Drawings. Dowels shall be supported during concreting operations so as to remain parallel with slab or wall surface and perpendicular to joint. Additional criteria is as follows:
1. Keyways: 1-1/2" deep x d/3 x continuous in walls, slabs, and between walls and footings, where "d" denotes specified wall or slab thickness, unless otherwise indicated by Drawings.
  2. Waterstops: Refer to Division 03 Section "Concrete Accessories".
  3. Walls: Space construction joints as follows:
    - a. Horizontal Spacing = 60 feet maximum.
    - b. Vertical Spacing = as shown on Drawings.
  4. Structural Slabs, Beams, and Girders: Horizontal unit of placement shall not exceed 90 feet in each direction. Girder construction joints shall not occur at face, inner or outer, of intersecting beam. Offset girder joint dimension equal to twice beam width from beam face. This requirement is not applicable to slabs-on-grade.
  5. Slabs-on-Metal-Deck: Horizontal unit of placement shall not exceed 90 feet in each direction.
  6. Avoid construction joints at areas specified to receive either thin-set tile or resilient floor finish materials. If unavoidable, Contractor shall make reasonable effort to minimize such occurrences. Slab grinding, chipping, filling at such occurrences to achieve specified floor tolerances will be at Contractor's expense.
  7. Contact surfaces of construction joints shall be cleaned and intentionally roughened. [by removing the entire surface and exposing clean aggregate solidly embedded in mortar

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matrix. The contact surface must be thoroughly cleaned by chipping or sand-blasting the entire surface not earlier than five (5) days after initial pour or by an approved method that will provide equal bond, such as a thorough hose-washing of surface not less than two or more than four hours after the concrete is placed (depending on setting time) with all wash water and chalk-like material being entirely cleaned from surface.] In event that contact surface becomes coated with earth or sawdust, after being cleaned, entire surface so coated shall be recleaned.

8. Do not make additional construction joints without Architect's written approval.

C. Crack Control Joints in Slabs-on-Grade: Crack control shall be provided by construction joints at perimeter of LARGE BLOCK PLACEMENTS with checkerboarded interior control joints thereby defining "slab panels". As option, use LANE PATTERN PLACEMENT having longitudinal construction joints with transverse control joints, thereby defining "slab panels". Use following additional criteria:

1. Construction Joints in slabs-on-grade shall be vertically formed, keyed, and doveled as indicated by Drawings. Finish with edging tool having radius of 1/8".
2. Control Joints in slabs-on-grade shall be either sawcut or formed with continuous inserts at Contractor's option, as follows:
  - a. Sawcut Option: Initial sawcuts shall be performed no later than 3 hours after final surface finishing of slab with equipment specifically suited and designed for early concrete sawcutting (dry cut saw) without dislodging aggregate. Perform Final Sawcuts as soon as possible where required to achieve specified joint size. Additional criteria is as follows:
    - 1) Initial Sawcuts: 1/8" min. width x 1" min. depth.
    - 2) Final Sawcuts: 1/8" min. width x t/4 min. depth where "t" denotes specified slab thickness.
    - 3) Final joint width of joints to receive sealant or grout shall be 1/4".
    - 4) If Initial Sawcuts can be installed to achieve final required control joint size, this is allowed.
3. Locate crack control joints at column centerlines and at intermediate intervals to restrict "slab panel" size to following limits:
  - a. 145 square feet at 4" slabs-on-grade.
4. "Slab panels" shall be approximately square, with no side longer than following:
  - a. 12 feet at 4" slabs-on-grade.
5. If LARGE BLOCK PLACEMENT is used, maximum permitted placement size shall be 10,000 sf. Plan geometry shall be approximately rectangular where possible, with no edge longer than 1.5 times shortest edge. LARGE BLOCK PLACEMENT criteria shall not operate to relieve Contractor of time limit for initial sawcutting crack control joints, where sawcut option is used. Reduce placement size as required to conform with initial sawcutting time limit.
6. If LANE PATTERN PLACEMENT is used, lanes shall be one "slab panel" in width. Length may be full width of slab in direction of lane placement, however, this shall not operate to relieve Contractor of time allotted for initial sawcutting crack control joints, where sawcut

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option is used. Reduce placement lane length as required to conform with initial sawcutting time limit.

- D. Expansion Joints and Isolation Joints: Construct as specifically shown by Drawings, typically without dowels, unless otherwise indicated.

### 3.3 CONCRETE PLACEMENT

A. General:

1. Concrete shall not be placed until forms and reinforcement have been inspected and preparations for placement have been completed.
2. Deposit concrete in forms as nearly in its final position as is possible to avoid rehandling.
3. Place concrete in reasonably uniform layers, approximately horizontal, and no deeper than 18 inches except that slabs shall be placed in single layer. Placement shall be in manner to avoid vertical or inclined construction joints or other planes of weakness.
4. Do not pile up concrete in forms in manner that will cause separation or loss of its ingredients.
5. Place concrete at rate that concrete is plastic at all times and flows readily into spaces between reinforcement.
6. Do not place concrete that has partially hardened or has been contaminated by foreign materials.
7. Do not retemper concrete or remix after initial set.
8. Do not place concrete on previously deposited concrete which has partially set or hardened sufficiently to cause formation of seams or planes of weakness. If section cannot be placed continuously, provide appropriate construction joint as specified herein.
9. Remove debris and hardened or partially hardened concrete which has accumulated on forms or reinforcement before work proceeds.
10. Do not permit concrete to drop freely greater than 6 feet. Use suitable equipment such as chute, tremie, or other approved conveyance where longer drops are necessary.
11. Do not pour directly into excavations where water is standing, unless specific procedures and mix design specifically planned in advance and suited for underwater concrete placement have been made.
12. Maintain reinforcement in proper position during concreting operations.

- B. Vibration: Thoroughly consolidate each layer of concrete as soon as it is deposited with mechanical vibrators and suitable hand tools, to work mixture well into parts and corners of forms, and entirely around reinforcement and embedded items. Equipment and procedures for consolidation shall conform to ACI 309, unless modified herein.

1. Do not overvibrate or use vibrators to transport concrete within forms.
2. Insert and withdraw vibrators in vertical manner at sufficient points no farther apart than visible effectiveness of vibrator. Vibrator shall penetrate rapidly to bottom of placed layer and at least 6 inches into preceding layer if there is such. Duration of vibration at each point shall be sufficient to consolidate concrete but not excessive so as to cause segregation.
3. Do not insert vibrator into lower layers that have begun to set.
4. Maintain spare vibrator on job site during concrete operations.

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C. Bonding:

1. Prepare for bonding of fresh concrete to previously deposited concrete where contact surface is specifically noted on Drawings to be "Intentionally Roughened", as follows:
  - a. Before depositing new concrete on or against previously deposited concrete which has partially or entirely set, roughen surface of concrete in manner which will expose aggregate uniformly and leave contact surface clean, free of laitance, dust, loosened particles of aggregate or otherwise damaged aggregate concrete, or other bond-inhibiting material. Intentionally roughen surface to achieve amplitude of approximately 1/4 inch.
  - b. Prepared surface of previously deposited concrete shall be dampened (but not saturated) immediately prior to placing fresh concrete.
2. Hardened concrete of horizontal joints in exposed work; horizontal construction joints in beams, girders, joists, and slabs; [and horizontal construction joints in work designed to contain liquids] shall be prepared same as described above for "Intentionally Roughened" surfaces. Additional requirements are as follows:
  - a. Apply approved Bonding Compound to roughened and cleaned surface of set concrete.
  - b. Mix and apply Bonding Compound in accordance with written instructions of manufacturer.
  - c. Apply fresh concrete to prepared surface within time limit recommended by Bonding Compound manufacturer.

D. Hot Weather Concreting:

1. Definition: Conditions requiring hot weather concrete practices are defined as any combination of high ambient temperature, high concrete temperature, low relative humidity, wind speed, and solar radiation that tend to impair quality of freshly mixed or hardened concrete by accelerating rate of moisture loss and rate of cement hydration, or otherwise causing abnormal or detrimental results.
  - a. Maximum acceptable concrete temperature at truck discharge point is 95 degrees F, unless otherwise specified.
  - b. When conditions occur which cause rate of evaporation of 0.2 lb./sq.ft./hr. or higher, as determined by ACI 305, Figure 2.1.5, precautions to avoid plastic shrinkage cracking shall be taken.
2. Records: Maintain records of outside air temperature, concrete temperature per ASTM C 1064, wind speed, relative humidity, and other general weather conditions that might impair concrete quality or strength during hot weather conditions as defined.
3. When hot weather conditions exist, as defined, following items, all or in part as required, shall be undertaken by Contractor to maintain acceptable concrete temperature and to minimize possibility of plastic shrinkage cracking:
  - a. Design concrete mixes specifically for hot weather conditions, utilizing fly ash, ground granulated blast-furnace slag, or both as partial replacements for Portland Cement.

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- b. Schedule concrete placement for early morning, late afternoon, or night, unless not permitted by Owner or other governing authority.
  - c. Cool ingredients before mixing to maintain concrete temperature at truck discharge point to below 95 degrees F. Mixing water may be chilled or use chopped ice to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
  - d. Cover reinforcing steel with water-soaked burlap such that steel temperature will not exceed ambient air temperature sufficiently in advance of embedding in concrete.
  - e. Fog spray forms, reinforcing steel, and subgrade just prior to placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
  - f. Use water-reducing retarding admixture when required by conditions.
  - g. Minimize time between mixing and placement of concrete.
  - h. Do not add water to ready-mixed concrete at job site unless it is part of amount initially required for proportioned mix design maximum W/C ratio and specified slump. Addition of water in excess of proportioned maximum water-cementitious material ratio to compensate for loss of workability is prohibited.
  - i. Plan concrete placements so that reinforcement has been placed and inspected, and forms, equipment and workers are ready to receive and handle concrete.
  - j. Keep equipment cool by spraying with water, including chutes, conveyors, pump lines, tremies, and buggies, however do not permit cooling water to effect water content and properties of fresh concrete.
  - k. Protect slab concrete during stages of placing and finishing against moisture loss due to rapid evaporation by applying fog mist spray above surface and applying monomolecular film, evaporation retarding agent.
  - l. Provide continuous curing, preferably moist curing during first 72 hours using absorptive blankets kept continuously wet, or, at appropriate pre-planned locations by applying curing compound complying with ASTM C 309, with moisture loss not exceeding 0.39 kg. per sq. meter in 72 hr. period. Use of curing compounds at floors to receive adhered floor coverings shall be in accordance with Div. 3 Section "Concrete Finishing" and shall be evaluated by Contractor prior to use for implications on concrete drying and satisfactory floor covering installation. Continue curing for minimum of 7 days. Do not change curing methods until concrete is at least 3 days old.
  - m. Loosen forms as soon as possible and run curing water down inside. When forms are removed, provide wet blanket curing cover to newly exposed surfaces for minimum of 7 days curing period. After curing period, covering should stay in place without wetting for additional 4 days.
4. Mass Concrete Requirements: Special batching, curing, and protection measures shall be used for concrete identified as "mass concrete". Batch mass concrete in accordance with paragraph above, "Mass Concrete Batching", and deliver to forms at temperature not less than 50 degrees F, but sufficient to control maximum temperature of 85 degrees F. Curing time and procedure is dependent on ambient conditions anticipated at time of placement, and therefore shall be developed by Contractor with consideration to applicable criteria of ACI 207.1R. Utilize fly ash, ground granulated blast-furnace slag, or both as partial replacements for Portland Cement. Subject to Engineer's approval.

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E. Cold Weather Concreting:

1. Definition:

- a. Do not place concrete when outside air temperature is 40 degrees F. or less unless cold weather concreting practices are followed as specified below. Use cold weather concreting practices whenever following conditions exist for more than 3 consecutive days:
  - 1) Average daily air temperature is less than 40 degrees F., where average daily air temperature is average of highest and lowest temperatures occurring during period from midnight to midnight.
  - 2) Air temperature is not greater than 50 degrees F. for more than one half of any 24 hour period.
- b. Concrete temperature at time that concrete is mixed and delivered to jobsite shall conform to following temperature ranges:

<u>Air Temperature</u>	<u>Minimum Concrete Temperature</u>
Above 30 degrees F.	60 F.
0 to 30 degrees F.	65 F.
Below 0 degrees F.	70 F.

- c. Minimum temperature of concrete during placement and curing shall be 55 degrees F.
- d. Maximum temperature of concrete at point of placement when heated by artificial means shall not exceed 90 degrees F.
- e. Maximum allowable temperature drop of concrete surfaces during first 24 hours after end of protection period shall not exceed following requirements:

<u>Section Size</u> <u>Minimum Dimension</u>	<u>Maximum Allowable</u> <u>Temperature Drop</u>
Less than 12"	50 degrees F.
12" to 36"	40 degrees F.
36" to 72"	30 degrees F.

- 2. Specification: Cold weather concreting practices required to maintain concrete temperatures as specified above shall be followed according to ACI 306.1.
- 3. Records:
  - a. Maintain records of date, time, outside air temperature, temperature of concrete as placed and general weather conditions during cold weather conditions.
  - b. Record air temperature and concrete temperature at regular intervals, but not less than 4 times per 24 hour period. Record concrete temperature at several locations on surface, corners, and edges of concrete to monitor effectiveness of protection provided. Use lowest reading to represent temperature of section at that time.
  - c. Record maximum and minimum temperature readings for each 24 hour period.

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4. Following items are considered minimum steps that shall be undertaken by Contractor during cold weather conditions to maintain acceptable concrete temperature. Other actions and procedures to satisfactorily protect concrete during cold weather conditions may be necessary and are responsibility of Contractor.
  - a. Design concrete mixes specifically for cold weather conditions. Use air entrainment (where acceptable), limit W/C ratio to 0.45, and obtain high early strength by using higher cement content, high early strength Portland Cement (Type III) or non-chloride, non-corrosive accelerator as specified.
  - b. Heat mixing water and adjust mixing water temperature by blending hot and cold water to obtain concrete temperature within specified acceptable range.
  - c. Uniformly heat aggregates to eliminate ice, snow, and frozen lumps of aggregate and to prevent moisture variation in stockpile.
  - d. Cover thawed or heated stockpiles with tarpaulins to retain heat.
  - e. Add air-entraining admixture to batch after water temperature has been reduced by contact with cooler solid materials.
  - f. Submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather.
  - g. Frozen subgrade shall be thawed prior to concrete placement.
  - h. Remove snow, ice, and frost such that it does not occupy space intended to be filled with concrete.
  - i. Cover metal embeds and wrap protruding reinforcing bars with insulation to avoid heat drain from fresh concrete and prevent localized freezing of concrete.

#### 3.4 SCREEDING CONCRETE (AT ELEVATED FLOOR SURFACES)

- A. Act of striking off surface of concrete to predetermined grade conforming to elevations shown on Drawings shall be accomplished with use of rigid screed guides. Use of wet screed guides is to be avoided on elevated surfaces. Additional requirements and suggestions are as follows:
- B. Concrete on Metal Deck and Steel Beam Framing System:
  1. Grade for strike off shall be set at predetermined distance above top surface of steel floor members. Metal deck continues to deflect for short period after strike off; subsequent restraightening of surface often moves concrete paste from over beams into resulting depressions. It is suggested that Contractor plan for initial slab thickness over beams of design depth plus 1/8 inch. This should provide sufficient material to restraighten surface and still maintain adequate concrete cover over beams.
  2. It is anticipated that occasional areas will be identified where actual deflection of steel beams during concreting operations differs from that anticipated by Engineer. At such locations, modify procedures by one or combination of following:
    - a. Residual camber after concrete placement: Modify fabricated camber in shop where possible. Where this is not possible, maintain initial thickness at midspan and increase slab thickness at each end of beam by 1/2 of amount of residual camber. In case of beam with 1/2 inch of residual camber, slab thickness at ends of this beam only might be increased by 1/4 inch.
    - b. Over-deflection of beam during concrete placement: Modify fabricated camber where possible. Where this is not possible, two options are suggested. Option one is to attach shore to underside of this beam only at midspan. Leave initial gap below shore equal to beam camber. As beam deflects during concrete placement, shore

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will stop deflection at desired point. Option two is to maintain initial concrete slab thickness at each end of this beam only, and to increase slab thickness at midspan by amount of over deflection experienced.

3. Bench mark shall be provided on each column for use by finishers as guide when they are completing finishing in these areas. It is suggested that mark be placed at predetermined distance above design grade (trowels are 16 inches long) for use by finishers in the removal of excess material as needed.
4. Contractor shall include in his bid any additional concrete required to achieve specified slab surface finish tolerance. Finish floor tolerances shall be as specified in Division 03 Section "Concrete Finishing".

C. Cast-in-Place Concrete Framing System:

1. Grade for strike off shall be set at predetermined distance above top surface of formwork. Minimum slab thickness, as specified on Drawings, shall be maintained throughout slab surface. Formwork continues to deflect for short period after strike off; subsequent restraightening of surface often moves concrete paste from over beams into resulting depressions. It is suggested that Contractor plan for initial slab thickness of design depth plus 1/8 inch. This should provide sufficient material to restraighten surface and still maintain adequate concrete cover over reinforcing steel.
2. It is anticipated that occasional local areas will be identified where actual deflection of formwork during concreting operations differs from that anticipated by Contractor. In these isolated areas only, adjustments in concrete thickness may be indicated or necessary. Minimum slab thickness, as specified on Drawings, shall be maintained throughout slab surface. Modify formwork camber where possible. Where over deflection of formwork occurs, maintain concrete slab design thickness at each end of affected beams and increase slab thickness at mid-span by amount of over deflection experienced.
3. Contractor shall include in his bid any additional concrete required to achieve specified slab surface finish tolerance. Finish floor tolerances shall be as specified in Division 03 Section "Concrete Finishing".

3.5 MISCELLANEOUS CONCRETE ITEMS

A. Floor Toppings: Place bonded and unbonded topping slabs indicated by Contract Documents conforming to following guidelines:

1. Bonded Toppings: Topping slabs less than 3 inches thick shall be considered to be bonded toppings unless specifically indicated otherwise. Topping slabs 3 inches thick and greater that are considered as bonded toppings are specifically noted as such in Drawings. Satisfactorily pre-plan and prepare for placement of bonded topping slabs as follows:
  - a. Finish surface of base concrete shall consist of "scratch finish" obtained when base course is partially set by brushing with coarse wire broom. No troweling permitted.
  - b. If base course has not been prepared with noted "scratch finish", then roughening of base slab surface by sandblasting or other approved mechanical methods to achieve satisfactory surface amplitude will be required. Surface amplitude shall not be less than 1/8" or as otherwise recommended by overlay installer and approved by Engineer.
  - c. Base slab roughening technique/equipment shall be a process selected by Contractor, however, certain high impact techniques, (including but not limited to

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scarifying, scabbling, and rotomilling), are known to result in “bruising” and/or “micro-cracking”, thereby weakening tensile/bond strength of substrate to receive bonded overlay. Where high impact surface preparation techniques are used, follow with sandblasting or other approved method.

- d. Remove deteriorated concrete, dirt, oil, grease, dust, and other bond-inhibiting materials from surface.
- e. Dampen prepared surface with clean water . Surface should be at moisture condition of saturated surface dry with no standing or glistening water at time of topping placement.
- f. Apply product “scrub-coat”, bonding agent, or bonding adhesive as recommended by overlay product manufacturer’s written instructions. Where manufacturer’s instructions do not require pre-dampening of prepared surface, omission of this step may be considered, but only with approval of Engineer.
- g. Use following concrete topping products:

<u>Topping Thickness</u>	<u>Product</u>
1/2” to 1”	Polymer-Modified Cementitious Mortar. (Use of other pre-mixed cement based mortars specifically manufactured for thin overlay applications may be considered but only with approval of Engineer.)
Greater than 1” but less than 3”.	Polymer-Modified Cementitious Mortar extended with 3/8” maximum aggregate. (Use of other pre-mixed cement based mortars with aggregate extension specifically suited for thin overlay applications may be considered but only with approval of Engineer.)
3” and greater	Conventional Concrete as specified in Drawings with bonding compound applied to base concrete.

- h. No topping shall be less than 1/2 inch in total thickness.

- 2. Unbonded Toppings: Topping slabs 3” thick and greater shall be considered as unbonded toppings unless specifically indicated otherwise. Prepare for placement of unbonded topping slabs as follows:

- a. Broom and vacuum clean base surface to receive topping.
- b. Apply appropriate bond breaker compound to base surface when indicated on Drawings.
- c. Use conventional concrete as specified in Drawings.

- B. Filling in: Fill in holes and openings left in concrete work for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

- C. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to hard, dense finish with corners, intersections, and terminations slightly rounded.

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- D. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- E. Column Base Plates, Equipment Bases, and Foundations: Grout column base plates, equipment bases and foundations as indicated using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless noted otherwise.
- F. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on Drawings. Screed, tamp, and finish as required by Division 03 Section "Concrete Finishing".

### 3.6 CURING, PROTECTING, AND FINISHING CONCRETE

- A. Refer to Division 03 Section "Concrete Finishing".
- B. Protect freshly placed concrete from washing by rain or flowing water.
- C. Do not allow concrete to dry out from time it is deposited in forms until expiration of curing period.
- D. Protect floor slabs, platforms, and steps whenever scaffolding, shoring, formwork, masonry, concrete, or other work is being done or above finished concrete slabs.
- E. Satisfactorily replace imperfect or damaged work, or material damaged or determined to be defective, before final completion and acceptance of entire job, in conformity with requirements of Drawings and Specifications, at Contractor's expense.
- F. After curing phase, control water at areas to receive adhesives, coatings, or other finish material(s) sensitive to moisture or water vapor.

### 3.7 FLOOR FLATNESS/LEVELNESS MEASUREMENT AND TOLERANCES

- A. Refer to Division 03 Section "Concrete Finishing" for required floor flatness and levelness criteria and Quality Control.

### 3.8 CLEANING

- A. Remove forms, equipment, protective coverings and rubbish resulting there from premises upon completion of work.
- B. Leave finished concrete surfaces in clean and undamaged condition, free of mortar, concrete droppings, loose dirt and mud, and satisfactory to Owner.
- C. Promptly, effectively and satisfactorily repair damage to floors.

### 3.9 FIELD QUALITY CONTROL

- A. The Owner will employ and pay a qualified independent testing agency to perform the following testing for field quality control, including special inspections required by local building code.

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Retesting of materials failing to meet specified requirements shall be done at Contractor's expense. Specific items and testing to be performed at Contractor's expense are noted as such.

1. Tests of Concrete required to determine compliance with this specification shall be made by a certified ACI Concrete Field Testing Technician, Grade I or equivalent.
2. The technician performing the strength tests shall be certified as an ACI Concrete Laboratory Testing Technician, Grade I or II or by an equivalent written and performance test program.
3. The laboratory performing the tests shall conform to the requirements of ASTM C 1077.

B. Structural Concrete Control and Testing:

1. Secure composite samples in accordance with ASTM C 172. Each sample shall be obtained from different batch of concrete on random basis, avoiding selection of test batch other than by number selected at random before commencement of concrete placement.
2. Perform sampling at following locations:
  - a. Adjacent to concrete mixer as concrete is delivered from mixer to conveying vehicle, unless otherwise noted.
  - b. At end of discharge hose, when concrete is pumped. Location shall be in reasonable close proximity to placement area, so as to satisfactorily simulate conditions at end of hose.
3. Concrete shall be tested as follows:
  - a. Mold and cure four specimens (one strength test) from each sample in accordance with ASTM C 31.
  - b. Two specimens shall be tested at seven days for information and two shall be tested at 28 days for acceptance. Acceptance test results shall be average of two specimens at 28 days.
  - c. Refer to Division 03 Section "Concrete Forming" for testing requirements for early formwork removal.
4. Deviations from requirements of ASTM Specifications shall be recorded in test report. Test concrete specimens in accordance with ASTM C 39.
5. Make at least one strength test for each 100 cu. yd. or fraction thereof or for each 5,000 square feet of floor slab or wall area, of each mix design of concrete placed in one day. Determine slump of concrete sample for each strength test and whenever consistency of concrete appears to vary, in accordance with ASTM C 143.
6. Make one additional strength test (four specimens) for each truck in which 2.5 gallons per cubic yard or more mixing water has been added to truck after concrete has been batched in Batch Plant. This additional strength test shall be at Contractor's expense.
7. Verify water to cement ratio is not exceeded if water is added to concrete mix in truck or otherwise. Addition of water beyond limits given on approved mix design shall not be permitted.

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8. Inspect each batch of concrete, report adjustment to amounts of mixing water and reason(s) for adjustment, in accordance with approved mix design, to assure uniform consistency from truck to truck. Check mixing time of concrete in trucks.
  - a. Testing Laboratory will issue Report of Field Inspection of Concrete for each concrete pour. Report shall identify project name, client, concrete supplier, date of placement, and name and signature of inspector.
  - b. Report will be in tabular form and include following information for each truck of concrete:
    - 1) Concrete cylinder set numbers, if cylinders were taken from that truck.
    - 2) Number of cylinders molded, if applicable.
    - 3) Time truck was dispatched and time unloaded.
    - 4) Number of yards of concrete in truck.
    - 5) Water-to-cement (W/C) ratio.
    - 6) Slump, air content, and admixtures.
    - 7) Concrete temperature.
    - 8) Specific location of placement. Use column grids whenever possible to describe location.
    - 9) Other remarks, i.e. amount of water added, if any, and reason(s).
9. Should strength of concrete fall below minimum, then additional tests may be required. These tests, if required, shall be made at Contractor's expense and shall be in accordance with ASTM C 42, and ACI 318. If core sample strength tests and/or load test results do not meet strength requirements, then structure, or part of structure shall be removed and replaced at Contractor's expense.
10. Testing Laboratory will issue timely consecutively numbered Concrete Compressive Strength Reports with following information for each set of strength test specimens:
  - a. Project name, Client, and concrete supplier.
  - b. Date sampled.
  - c. Name of technician performing inspection with ACI certification number.
  - d. Truck number and ticket number.
  - e. Concrete batch weights and whether or not batch plant inspection was performed.
  - f. Time concrete was batched and time sampled.
  - g. Air temperature and concrete temperature at time of sampling.
  - h. Slump, air content, and water-to-cement ratio.
  - i. 28 day compressive strength requirement, f'c.
  - j. Concrete mix designation, number, or other identification.
  - k. Descriptive and graphic location of placement. Provide grid locations whenever possible to describe location.
  - l. Concrete cylinder set number.
  - m. Date tested, concrete age, and compressive strength results.
  - n. Remarks that may affect concrete quality, including water added at site, elapsed time between start of mixing to completion of placement, and variation in curing requirements.
11. Report promptly to Architect details of non-conforming concrete. Give information concerning locations of concrete pours, quantities, date of pours and other pertinent facts concerning concrete represented by specimens.

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C. Early Formwork Removal Time Control and Testing:

1. If early formwork removal is desired by Contractor, additional cylinders and testing performed for this purpose are required and shall be at Contractor's expense.
2. Testing requirements are specified in Division 03 Section "Concrete Forming".

END OF SECTION

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**SECTION 03 3511  
CONCRETE FLOOR FINISHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface treatments for interior concrete floors and exterior elevated floor slabs.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.
- B. Section 09 6700 - Fluid-Applied Flooring.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with concrete floor placement and concrete floor curing.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

**1.05 MOCK-UP**

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 10 feet square.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

**PART 2 PRODUCTS**

**2.01 CONCRETE FLOOR FINISH APPLICATIONS**

- A. Unless otherwise indicated, all concrete floors are to be finished using penetrating sealer.
- B. Penetrating Clear Sealer:
  - 1. Use at following locations: Interior and exterior concrete slabs..

**2.02 DENSIFIERS AND HARDENERS AT EXTERIOR ELEVATED SLAB.**

- A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.
  - 1. Products:
    - a. PROSOCO, Inc; Consolideck LS/CS:
    - b. W. R. Meadows, Inc; IntraGuard.
    - c. Substitutions: See Section 01 6000 - Product Requirements.

**2.03 COATING AT INTERIOR CONCRETE SLAB.**

- A. Penetrating Sealer: Transparent, non-yellowing, water- or solvent-based coating.
  - 1. Composition: Silicate.
  - 2. Products:
    - a. Concrete Sealers USA:
    - b. Laticrete.
    - c. W.R. Meadows, Inc..
    - d. Prosoco.
    - e. Substitutions: See Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

### **3.02 GENERAL**

- A. Apply materials in accordance with manufacturer's instructions.

### **3.03 COATING APPLICATION**

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
- C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

**END OF SECTION**

**SECTION 04 2000  
UNIT MASONRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.
- B. Section 05 5000 - Metal Fabrications: Loose steel lintels.
- C. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
- D. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
- E. Section 07 2500 - Weather Barriers: Water-resistive barriers or air barriers applied to the exterior face of the backing sheathing or masonry.
- F. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- G. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2021.
- C. ASTM C91/C91M - Standard Specification for Masonry Cement 2023.
- D. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units 2017.
- E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.
- F. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.
- H. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) 2022.
- I. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019a, with Editorial Revision.
- J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.
- K. ASTM C476 - Standard Specification for Grout for Masonry 2022.
- L. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units 2021.
- M. ASTM C1634 - Standard Specification for Concrete Facing Brick and Other Concrete Masonry Facing Units 2020.
- N. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2019a.
- O. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

- P. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane 2015, with Editorial Revision (2022).
- Q. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry 2020.
- R. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing 2017.
- S. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls 2017.
- T. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls 2005.
- U. BIA Technical Notes No. 46 - Maintenance of Brick Masonry 2017.
- V. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

#### **1.06 MOCK-UP**

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

### **PART 2 PRODUCTS**

#### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Non-Loadbearing Units: ASTM C129.
    - a. Solid block with burnished face as noted on drawings..

#### **2.02 BRICK UNITS**

- A. Manufacturers:
  - 1. Endicott Clay Products Co:
  - 2. Acme Brick:
  - 3. Trinity Brick
  - 4. Substitutions: See section 01 6000 - Product Requirements.
- B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
  - 1. Color and texture: to match existing campus structures.
  - 2. Nominal size: As indicated on drawings.
  - 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

## **2.03 MORTAR AND GROUT MATERIALS**

- A. Masonry Cement: ASTM C91/C91M, Type N.
- B. Portland Cement: ASTM C150/C150M, Type I.
  1. Not more than 0.60 percent alkali.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
  1. Color: To be selected.
- H. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
  1. Type: Fine.

## **2.04 REINFORCEMENT AND ANCHORAGE**

- A. Manufacturers:
  1. Blok-Lok Limited:
  2. Hohmann & Barnard, Inc
  3. WIRE-BOND
  4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
  1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
  2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
  3. Vertical adjustment: Not less than 3-1/2 inches.
- C. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

## **2.05 FLASHINGS**

- A. Metal Flashing Materials: as shown on drawings,
- B. Membrane Asphaltic Flashing Materials:
  1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; 8 mil cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
    - a. Manufacturers:
      - 1) Heckmann Building Products, Inc:
      - 2) WIRE-BOND:
      - 3) York Manufacturing, Inc:
      - 4) Substitutions: See Section 01 6000 - Product Requirements.
- C. Membrane Non-Asphaltic Flashing Materials:
  1. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch thick.
    - a. Manufacturers:
      - 1) Heckmann Building Products, Inc:
      - 2) Hohmann & Barnard, Inc:



- 3) WIRE-BOND:
- 4) Substitutions: See Section 01 6000 - Product Requirements.
- D. Factory-Fabricated Flashing Corners and End Dams: PVC with Elvaloy KEE.
  - 1. Manufacturers:
    - a. Hohmann & Barnard, Inc:
    - b. Mortar Net Solutions:
    - c. York Manufacturing, Inc:
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- E. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
- F. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- G. Drip Edge: Prefinished metal as shown on drawings, angled drip with hemmed edge; compatible with membrane and adhesives.
- H. Lap Sealants and Tapes: As recommended by flashing manufacturer and/or industry standards compatible with membrane and adhesives.

## 2.06 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
  - 1. Manufacturers:
    - a. Blok-Lok Limited:
    - b. Hohmann & Barnard, Inc:
    - c. WIRE-BOND:
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
  - 1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
- D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.
- E. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 1000.
- F. Weeps:
  - 1. Type: Polyester mesh.
  - 2. Color(s): As selected by Architect from manufacturer's full range.
  - 3. Manufacturers:
    - a. Advanced Building Products, Inc:
    - b. Blok-Lok Limited:
    - c. CavClear/Archovations, Inc:
    - d. Mortar Net Solutions:
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

## 2.07 LINTELS

- A. Brickwork Support System: Offset steel relief angles or lintels with hanger brackets for support of brickwork above horizontal masonry joints and openings to allow insulation to span continuously behind brick and eliminate continuous thermal bridges associated with support systems that interrupt continuous insulation.
  - 1. Configuration: Relief angle or lintel with welded hanger brackets anchored to structure.
  - 2. Sizes: Component and anchor sizes and spacing to be determined by manufacturer from calculations or prescriptive design tables to suit project loading conditions and cavity width

indicated on drawings.

## **2.08 MORTAR AND GROUT MIXING**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  - 1. Masonry below grade and in contact with earth: Type S.
  - 2. Exterior, non-loadbearing masonry: Type N.
  - 3. Interior, non-loadbearing masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- E. Mixing: Use mechanical batch mixer and comply with referenced standards.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

### **3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### **3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

### **3.04 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
- D. Brick Units:
  - 1. Bond: Running.
  - 2. Mortar Joints: Concave.

### **3.05 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

### **3.06 WEEPS/CAVITY VENTS**

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

### **3.07 CAVITY MORTAR CONTROL**

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

### **3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER**

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

### **3.09 MASONRY FLASHINGS**

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Extend flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel or metal angled drip with hemmed edge.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

### **3.10 LINTELS**

- A. Install loose steel lintels over openings.
- B. Install thermal brick support system in accordance with manufacturer's instructions at locations indicated on drawings

### **3.11 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

### **3.12 BUILT-IN WORK**

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

### **3.13 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.

### **3.14 CUTTING AND FITTING**

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### **3.15 CLEANING**

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

**END OF SECTION**

**SECTION 05 1200**  
**STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes structural steel and supplementary items necessary to complete work required for its installation.
- B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.
- C. Miscellaneous metal fabrications, steel joists and metal deck are specified elsewhere in Division 5.

**1.2 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Preliminary Connection Review with Steel Fabricator:
  - 1. Proposed variations in details shown on drawings will be considered and such variations must have preliminary approval prior to preparation of detailed shop drawings.
- C. Submit in advance of fabrication, complete shop drawings prepared under supervision of Registered Professional Engineer necessary for fabrication of each component part of structural steel framing including following:
  - 1. Member size, length and camber.
  - 2. Bill of materials.
  - 3. Material specifications.
  - 4. Bolt hole size, bolt size and bolt type.
  - 5. Details of cuts, copes and bevels.
  - 6. Piece marks for field assembly.
  - 7. Splices.
- D. Submit erection drawings ("E" Sheets) as part of shop drawings, showing complete information necessary for erection of each component part of structural steel framing, including following:
  - 1. Setting drawings, templates and directions for installation of anchor bolts and other anchorage devices embedded in concrete or masonry work.
  - 2. Dimensions for alignment and elevation of each member.
  - 3. Location of members and attachments by match-marking of piece members.
  - 4. Type and location of each field connection.
  - 5. Required number and location of shear connectors on each member.
  - 6. Details of each field connection or typical connection.

7. Piece marks for field assembly.
  8. Splices.
  9. Size, length and type of bolts required in each field connection.
- E. Shop drawings shall not be made by using reproductions of Contract Drawings.
- F. Shop drawing shall be submitted through General Contractor to Architect. Any fabrication of material before approval of drawings will be at risk of Contractor.
1. Fabricated material and connections shall fit within architectural constraints.
  2. Fabricator alone shall be responsible for errors of detailing and fabrication.
- G. Both shop and field welding and required non-destructive testing shall be indicated on shop drawings by welding symbols and nondestructive testing symbols as shown in latest edition of AWS SPEC. A2.4 SYMBOLS FOR WELDING AND NON-DESTRUCTIVE TESTING.
1. Special conditions shall be fully explained by added notes or details.
  2. Welding symbols for groove welds shall indicate groove depth required to obtain specified effective throat thickness for welding process and position of welding to be used.
  3. Details of groove welds, joints, and preparation of base material shall be referenced to pre-qualified joint specified in AWS Code Figs. 2.9 through 2.11 and shall clearly distinguish between complete joint penetration and partial joint penetration.
  4. Fillet weld symbols shall indicate required weld size to obtain required effective throat thickness and effective length.
- H. Welding Procedures:
1. Welding Procedure Specification (WPS) for both shop and field welds, which are deemed prequalified in accordance with AWS Code Section 5 shall be prepared as written procedures and shall be made available to testing agency and posted next to welding equipment in Fabricator's plant.
  2. Welding Procedures Specifications (WPS) and other procedures, along with tests required to qualify procedure in accordance with AWS Code Section 5.2, shall be submitted for approval prior to use.
- I. Submit manufacturer's certification and test data that following items furnished conform to following specifications:
1. High strength bolts, including nuts and washers, ASTM A 325 or ASTM A 490.
  2. Filler metal for welding - appropriate AWS Specification - refer to Paragraph 2.2/F.
  3. Shear connectors - ASTM A 108 - stud base qualification requirements in accordance with AWS Code Appendix IX.
  4. Non-shrink grout
  5. Structural steel primer paint
  6. Inorganic or other protective coatings.
  7. Direct tension indicators.
  8. Tension control bolts.

- J. Fabricator/Erector shall submit to Testing Laboratory reports of non-destructive testing required of them. These reports shall be on AWS suggested forms or similar form containing same information.
- K. Contractor shall submit to the Engineer and the enforcing agency, for acceptance, a quality control or inspection plan that addresses all inspection issues, including in process and final inspection that are addressed in AWS D1.1.
- L. The qualification of the contractor's Inspectors and NDE personnel shall be submitted to the engineer and enforcement agency for acceptance.

### **1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
  - 1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges" including "Commentary".
    - a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:
      - 1) "Where the fabricator must select or complete connection details, this approval constitutes acceptance by the owner's authorized representative of design responsibility for the structural adequacy of such connections. If a fabricator wishes to change a connection that is fully detailed in the contract documents, the fabricator shall submit the change for review by the owner's authorized representative in a manner that clearly indicates that a change is being requested. Approval of this submittal constitutes acceptance by the owner's authorized representative of design responsibility for the structural adequacy of the changed detail."
  - 2. AISC "Specification for Structural Steel Buildings.
  - 3. AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts".
  - 4. American Welding Society (AWS) D1.1-94 "Structural Welding Code - Steel."
  - 5. ASTM A 6 "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
  - 6. Steel Structures Painting Council - "Steel Structures Painting Manual", Volumes 1 and 2.
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
  - 1. Fabricator and Erector shall provide Architect and Testing Laboratory with names of welders to be employed on Work, together with certification that each of these welders has passed qualification tests using procedures covered in American Welding Society Standard D1.1, and/or D.1.3 as applicable to specific welding work to be performed.
    - a. Fabrication shop welders shall be certified by qualification tests and recertified per AWS requirements within the last year.

- b. Field erection welders shall be certified by test within the last year or shown to be continuously employed by erector since initial qualification tests and recertified per AWS requirements within the last year.
- 2. If recertification of welders is required to meet the above criteria, retesting will be Contractor's responsibility.
- C. Steel Erector shall have 10 years experience.
  - 1. Certified Welders - Refer to Paragraph "B" above.
- D. Members designated on drawings (if any) as "Architectural Exposed Structural Steel" (AESS) shall comply with AISC Code, Section 10. This section covers fabrication care, erection care and dimensional tolerances of AESS members and components.
  - 1. Match abutting cross-section configuration so that joints align.
  - 2. Grind smooth all weld joints to remove weld show-through.
- E. Material shall be properly identified in accordance with UBC, 1994 Edition, Section 2202.]

#### **1.4 PROPOSED SUBSTITUTIONS**

- A. Substitutions of sections or modifications of details, if proposed by Contractor, shall be submitted for approval in sketch form prior to submission of shop drawings, and such substitutions shall be made only when approved by Architect, and at no additional cost to Owner. Total amount of credit, if any, shall be stated in writing with submission.
- B. Corrections for inaccuracies that result in change from Structural Drawings or final approved shop drawing details shall be submitted in sketch form for approval. Such substitutions or corrections shall be made only when approved by Architect.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.
  - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
  - 2. Store materials, other than fabricated steel, in weathertight containers until ready for use in work. Store containers in dry place.
  - 3. Store electrodes in rod ovens and heat in accordance with AWS Code section 4.5 prior to use in welding.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Specific product, material or manufacturer listed under each item below is “acceptable” only if manufacturer can evidence product compliance with requirements of Contract Documents.
- B. For manufacturers not listed, submit as substitution according to the Conditions of the Contract and Division 1 Specification Sections.

### **2.2 MATERIALS**

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Structural Steel: Shapes, bars, plates and structural pipe as indicated on Structural Drawings conforming to one of following ASTM Specifications are approved for use under this specification. Base plates and column materials are to be inspected and tested as specified in Paragraph 2.2.B.7.
  - 1. Structural Steel Shapes, Plates, and Bars - Carbon Steel, ASTM A 36, “Standard Specification for Structural Steel.”
  - 2. Welded and Seamless Pipe - ASTM A 501, or ASTM A 53, Types “E” or “S”, Grade B, 35,000 psi minimum yield strength.
  - 3. Structural Tubing - ASTM A 500, Grade B, 46,000 psi minimum yield strength.
  - 4. Structural Steel Shapes, Plates, and Bars - High Strength Steel, ASTM A 572, Grade 50, “Standard Specification for High Strength Low Alloy Columbium-Vanadium Steels of Structural Quality.
  - 5. Supply fine grain killed steel for Group 3, 4 and 5 rolled shapes, (W14 series W14 x 145 and larger and W12 series W12 x 120 larger).
  - 6. Steel in Group 3, 4 and 5 rolled shapes subjected to primary tensile stresses due to tension or flexure, or spliced with full penetration welds shall be supplied with Charpy V-Notch testing in accordance with ASTM A 6, Supplementary Requirement S5. Impact test shall meet minimum average value of 20 ft.-lbs. absorbed energy at +70 deg. F. and shall be conducted in accordance with ASTM A 673 with following exceptions:
    - a. Center longitudinal axis of specimens shall be located as near as practical to midway between inner flange surface and center of flange thickness at intersection with web mid-thickness.
  - 7. For plates exceeding 2 inch thickness, steel shall be supplied with Charpy V-Notch testing in accordance with ASTM A 6, Supplementary Requirement S5. Impact test shall be conducted in accordance with ASTM A 673, Frequency P and shall meet a minimum average value of 20 ft.-lbs. absorbed energy at +70 deg. F.



8. Steel plates 1-1/2 inches and thicker shall be tested in mill in conformance with ASTM A 435, "Straight-Beam Ultrasonic Examinations of Steel Plates" using S1 Supplementary Requirements to assure delivery of steel plates free of gross internal discontinuities such as pipe, ruptures, and laminations.

C. High Strength Bolts and Washers:

1. High strength bolts for structural joints, including suitable nuts and plain hardened washers - ASTM A 325 SC and ASTM A 325 N where noted.
  - a. Bolts and nuts for high strength bolts shall be heavy hex head conforming to ANSI Standards B18.2.1 and B18.2.2 respectively. Nuts shall conform to ASTM A 563, "Standard Specification for Carbon and Alloy Steel nuts".
  - b. Washers shall be circular, flat and smooth and shall conform to requirements of Type A washers in ANSI Standard B23.1. Washers for high strength bolts shall be hardened and conform to ASTM F 436, Specification for Hardened Steel Washers. Beveled washers for American Standard Beams and channels shall be square or rectangular, shall taper in thickness (16-2/3 percent slope) with average thickness of 5/16 inch. When an outer face of a bolted part has a slope greater than 1:20 with respect to a plane normal to bolt axis, a beveled washer shall be used.
2. Quenched and tempered alloy steel bolts for structural steel joints - ASTM A 490.
3. Direct Tension Indicator Tightening Devices and Alternate Design Fasteners shall conform to RCSC Specification for Structural Joints, except as modified below.
  - a. Direct Tension Indicator washers conforming to the requirements of ASTM F 959.
    - 1) J.M. Turner, Inc.
    - 2) Applied Bolting Technology
  - b. Tension Control Bolts Conforming to AISC RCSC, Section 2 d), using pre-assembled sets of nut, washer and bolt.
    - 1) Bristol Machine Company
    - 2) NSS Industries and Lohr Structural
    - 3) Le Jeune
  - c. Each diameter, grade, and production lot shall have pre-installation testing preformed by testing lab prior to the fasteners being installed in the structure.
4. Bolts shall be new and shall not be reused.
5. Bolts shall be well lubricated at time of installation. Dry, rusty bolts will not be allowed. Bolts shall be lubricated at time of installation per ASTM A 325/A 490 and AISC RCSC.
6. Galvanized Bolts: Provide bolts, nuts and washers that are hot dip galvanized according to ASTM A 153, Class C when used to connect steel called for on drawings or in specifications as hot dip galvanized after fabrication.

- D. Automatic End Welded Studs Used as Shear Connectors or Headed Stud Anchors for Concrete Embeds:
1. Automatic end welded studs shall be Nelson Granular Flux-filled Shear Connector or Anchor Studs (or approved equal).
  2. Studs shall be manufacturer of cold-finished carbon steel which conforms to ASTM A108, Grade 1015 or 1020. Minimum tensile strength: 60,000 psi; Minimum elongation: 20 percent in two inches, AWS Table 7.1, Type B.
  3. Dimensional tolerances of shear connectors shall be in accordance with Fig. 7.1 of AWS Code. Size and length shall be as indicated on Structural Drawings.
  4. Arc shield ferrule of heat-resistant ceramic material shall be furnished with each stud.
  5. Suitable deoxidizing and arc-stabilizing flux for welding shall be furnished with each stud of 5/16 inch diameter or larger. Studs less than 5/16 inch in diameter may be furnished with or without flux.
  6. Only studs with qualified stud bases in accordance with AWS Appendix IX shall be used. See Submittals.
  7. Ceramic ferrules used in stud welding process shall be completely removed by Fabricator/Erector from area where concrete is to be placed.
- E. Anchor Bolts: Carbon steel externally and internally threaded standard fasteners - ASTM A 307, unless noted otherwise, or ASTM A 449 where noted.
- F. Filler Metal for Welding: Provide filler metal having a notch toughness not less than 20 ft.-lbs. at -20 degrees F. as measured by Standard Charpy V-Notch Test, ASTM E 23. The minimum required energy absorption is 20 ft.-lb. average. One specimen may be less than the minimum average, but not less than 15 ft.-lbs. All electrodes shall meet code quality.
1. Conform to following AWS Specifications for welding process used:
    - a. Shielded Metal Arc Welding (SMAW) - AWS A5.1.
    - b. Flux Core Arc Welding - Self shielded (FCAW-SS) - AWS A5.20 or A5.29.
    - c. Flux-Core Arc Welding - Gas shielded (FCAW-G) - AWS A 5.20.
  2. Maximum diameter of electrodes allowed for SMAW is per AWS D1.1, Section 4.6. Maximum diameter of electrodes allowed for FCAW is per AWS D1.1, Section 4.14 except that the maximum diameter for the flat and horizontal position should be limited to 7/64 inch. Welding materials must be used within the positions, thicknesses, temperatures and other parameters provided by the manufacturer.
  3. Maximum width and thickness of weld layers shall be per AWS D1.1, Section 4.6 for SMAW and Section 4.14 for FCAW except that at the maximum width of a layer in any position should not exceed 5/8 inch.
- G. Nonshrink Grout:
1. Material shall be ready-to-use metallic or nonmetallic aggregate product requiring only addition of water at jobsite and shall produce flowable grouting material having no drying shrinkage at any age. Compressive strength of grout shall be not less than 6,000 psi at 7 days and 8,000 psi at 28 days.
  2. Subject to compliance with requirements, acceptable nonshrink grout are as follows:

- a. Cormix Construction Chemicals - "Supreme"
  - b. Euclid Chemical Co. - "Euco N-S"
  - c. Master Builders - "Master Flow 928 Grout"
- H. Structural Steel Primer Paint: Fast curing, lead and chromate free, modified Alkyd Rust-Inhibitive Primer exceeding performance requirements of Federal Specification TT-P-86d, Type I. TNEMEC Company, Inc., 10-99 TNEMEC Primer, red color; 10-1009 TNEMEC Primer, Gray Color for second coat, where specified.
  - 1. 56 percent solids by volume.
  - 2. Maximum Volatile Organic Compounds, thinned: (VOC) of 3.25 lbs/gallon.
  - 3. Physical Test Result: ASTM B117 Salt Spray (Fog): No blistering, cracking, softening, or delamination of film. No rust creepage at scribe and no rusting at edges after 500 hours.
- I. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
- J. Miscellaneous Materials and Accessories: As specified hereinafter under various items of work and/or as indicated on drawings or required for good construction practice.
- K. [Slide Bearings: Bearing pads, upper and lower units shall be CON-SLIDE Type CSA elements as manufactured by CON-SERV Inc., East Hanover, N.J.
  - 1. Sliding Surfaces shall be nominal 3/32" glass-filled virgin TFE factory bonded with a tested epoxy to a steel back-up plate. The bonding shall be done in a heated bonding press under controlled pressure.
  - 2. The coefficient of friction shall average 0.06 under a compressive load of 2000 psi.
  - 3. The compressive creep shall be a maximum of 2% at 2000 psi at 70 degrees F.
  - 4. Elements shall be flat, clean, and prepared for installation in the structure. Slots and holes if required shall be fabricated in the bearing manufacturer's plant.

## 2.3 FABRICATION

- A. Work shall be shop-assembled insofar as possible and delivered to site complete and ready for erection. Material shall be properly marked and match-marked where field assembly is required. Sequence of shipments shall be such as to expedite erection and minimize handling of material. Fabricate structural steel in accordance with AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (Ninth Edition), [AISC Load and Resistance Factor Design Specification for Structural Steel Buildings] and AISC Code of Standard Practice (Ninth Edition).
  - 1. Structural steel which is used for main components and which is required to have yield stress greater than 36 ksi shall in fabrication plant be marked by painting ASTM Specification designation on piece. This identification shall remain on piece throughout erection.

2. Rolled material before being laid out and after being worked must be straight with tolerance allowed by ASTM Specification A.6, unless noted otherwise. If straightening is necessary, it may be done by mechanical means or by application of limited amount of localized heat. Temperature of heated areas shall not exceed 1,200 deg. F. for material specified herein.
3. Beams, girders and trusses shall be cambered as indicated on Structural Drawings. Specified camber shall be within tolerance of minus zero to plus 1/2" for members 50 feet and less; and minus zero to plus 1/2" plus 1/8" for each 10 feet or fraction thereof in excess of 50 feet. Members without specified camber shall be fabricated so that after erection any minor camber due to rolling or fabrication shall be upward.
  - a. Cambering shall be performed so as to result in a parabolic profile.
  - b. Cold cambering may be performed where beam size is applicable. Where cold cambering will cause web or flange buckling, tearing or other damage to the beam, other means shall be employed (i.e. heat cambering).

B. Finishing of member shall be in accordance with following:

1. Column Base Plates:
  - a. Rolled base plates 2 inches or less in thickness may be used without planing, provided a satisfactory contact bearing surface is obtained.
  - b. Rolled base plates over 2 inches and less than 4 inches in thickness may be straightened by pressing or by milling bearing surfaces to obtain a satisfactory contact bearing surface.
  - c. Bottom surface of column base plates which are grouted on foundations need not be planed.
  - d. Top surfaces of base plates with columns full-penetration welded need not be pressed or milled.
  - e. Anchor Bolt Holes in Baseplates shall be made oversize as follows:

<u>Bolt Size</u>	<u>Hole Size</u>
3/4" dia. to 1" dia. incl.	Dia. + 5/16"
Over 1" dia. to 2" dia. incl.	Dia. + 1/2"
Over 2" dia.	Dia. + 3/4"

2. Column Ends:
  - a. Compression joints depending upon contact bearing shall have bearing surface prepared to common plane by milling or other approved means in accordance with AISC Standards.
  - b. Milled or machined surfaces shall be protected against corrosion by a rust inhibiting coating that can be easily removed prior to erection.
  - c. Members to be milled shall be completely assembled before milling.
3. Beam and Girder Ends:
  - a. Oxygen cut ends shall, wherever practicable, be done by mechanically guided torch.

- b. Oxygen cut edges which are subject to stresses shall be free from gouges. Occasional gouges greater than 3/16 inch that remain from cutting shall be removed by grinding.
  - c. Oxygen cut edges which are to have weld metal deposited on them shall be in accordance with AWS Code Sec. 3.2.
  - d. Corners shall be smooth and rounded to minimum 1/2 inch radius, but in no case less than AISC minimum dimensions
- 4. Remove mill scale from columns in the area where the beam flanges will be welded to the column.
- C. Splices in Structural Steel: Splicing of structural steel members in shop or field is prohibited without prior approval of Engineer. Members having splice not shown and detailed on approved shop drawings will be rejected.
- D. Shop connections shall be high strength bolted (slip critical or bearing type) or welded, as indicated on Structural Drawings or approved shop drawings.
- E. High strength bolted construction assembly shall be in accordance with AISC Specification for Structural Joints using ASTM A 325 or A 490 bolts.
  - 1. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible material. Joint surfaces shall be free of burrs and other foreign materials. Hot-dip galvanized contact surfaces shall be scored by wire brushing or blasting prior to assembly.
  - 2. If thickness of material is not greater than normal diameter of bolt plus 1/8 inch, holes may be punched. If thickness of material is greater than normal diameter of bolt plus 1/8 inch, it shall be drilled full size or sub-punched 1/16 inch smaller than bolt diameter and reamed to full size.
  - 3. Bolt holes shall be normal diameter not more than 1/16 inch in excess of normal bolt diameter unless otherwise specified on Structural Drawings. Slotted or oversize bolt holes, if required, shall be as specified in AISC Specification for Structural Joints Sec. 3©.
  - 4. Beam to Beam and Beam to Column Connections: Standard shear connections shall utilize bearing-type bolts with threads allowed across the shear plane (Type N).
  - 5. Bearing-Type Bolt Tightening: Standard shear connections utilizing bearing-type bolts need only be tightened to the snug tight condition. This is the tightness that exists when all the plies in a joint are in firm contact, generally achieved by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
  - 6. Slip-Critical Connections: Connections indicated as slip-critical shall utilize friction type bolts (Type SC) with [approved tightening method using Direct Tension Indicator washers installed with Tension Control Bolts] or [Direct Tension Indicators]. Bolts used in moment connections and tension members shall be considered as slip-critical fasteners.
  - 7. A 325 or A 490 bolts, regardless of method of tightening, shall have hardened washer installed per RSCS paragraph 7.c, 1 through 8. A 490 bolts used to connect material having specified minimum yield point less than 40 ksi shall have washer installed under bolt head and one installed under nut.

8. When tightening is done by calibrated wrench method, nut or bolt rotation from snug tight shall not be greater than that permitted in Table 5 of AISC Specification for Structural Joints.

F. Holes for Other Work:

1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members as shown on contract documents, and/or final shop drawings.
2. Provide specialty items as indicated to receive other work.
3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

G. Welded construction shall be performed in accordance with AWS Structural Welding Code D1.1-94, Sections 2 thru 7, and Section 8, 9 or 10, whichever is applicable.

1. Only welded joints deemed as being prequalified in accordance with AWS D1.1-94 Sec. 5.1, which are selected from AWS Code Figs. 2.1 thru 2.5 are approved for use.
2. A Welding Procedure Specification (WPS) with the information required by AWS D1.1, Section 5, shall be submitted to the Owner's Engineer and the enforcement agency for acceptance prior to the start of work.
  - a. The WPS shall be used in providing the required special inspection.
  - b. The WPS shall contain the actual values to be used for the welding parameters and variables so that instruction is provided to welders; as a minimum the WPS shall list the position, electrode type and size, travel speed, electrode stick-out, voltage and amperage with acceptable limits, bead size, weld sequence, stress relieving, and other pertinent data.
  - c. A copy of the filler metal manufacturer's technical data sheet should be submitted with each WPS.
  - d. For WPS's which require qualification, Procedure Qualification Records (PQRs) shall also be submitted for acceptance. Production welding heat input shall be limited based on the PQR.
  - e. The welding parameters are a function of each electrode. The written WPS should be developed by a competent welding engineer, and the individual welding parameters should be within the electrode manufacturer's range of operation.
  - f. Approved WPS's shall be posted at appropriate locations throughout the job site or fabricator's shop to be available to welders, supervisors and inspectors.
3. WPS's for groove welds joining the beams flanges to the column shall meet or exceed the workmanship and technique requirements of AWS D1.1. WPS's for FCAW should be qualified by testing in accordance with AWS D1.1, Section 5. The tests should include Charpy V-Notch (CVN) tests of the weld metal and the heat affected zone (HAZ). The CVN test temperature should be at least 30 degrees F colder than the Lowest Service Metal Temperature (LSMT) and not warmer than zero degrees F. The minimum required energy absorption is 20 Ft-Lbs. average. One specimen may be less than the minimum average, but not less than 15 Ft-lbs. The tests should be conducted in accordance with AWS D1.1, Appendix III.

4. For highly restrained joints, or where shrinkage is likely to cause problems, the Contractor shall submit a weld shrinkage and distortion control plan to the Engineer for review to determine compliance with design intent.
5. Welders, welding operators and tackers to be employed under this specification, shall have been qualified by test and certified by Qualified Agency or person as prescribed in AWS Code Sec. 5, Parts C, D and E, within last year. These qualifications shall be made available to Owner's Testing Laboratory for examination.
6. Welders that will make welds with restricted access, such as, but not limited to, the bottom flange to column welds through a cope hole or access hole in the beam web, or where access to the bottom of a groove is restricted by the presence of a column flange, shall be qualified by the Contractor using the same welding procedure as will be used for production and a mock-up assembly that simulates the construction configuration.
7. Welding process shall be prequalified and limited to following processes:
  - a. Shielded Metal Arc Welding (SMAW)
  - b. Flux-Core Arc Welding - Self Shielded (FCAW-SS)
  - c. Flux-Core Arc Welding - Gas Shielded (FCAW - G)
  - d. Welding process not pre-qualified must be qualified by test.
8. Maximum diameter of electrodes allowed for SMAW is per AWS D1.1, Section 4.6. Maximum diameter of electrodes allowed for FCAW is per AWS D1.1, Section 4.14 except that the maximum diameter for the flat and horizontal position should be limited to 7/64 inch. Welding materials must be used within the positions, thicknesses, temperatures and other parameters provided by the manufacturer.
9. Maximum bead width and thickness of weld layers shall be per AWS D1.1, Section 4.6 for SMAW and Section 4.14 for FCAW except that the maximum width of a bead in any position should not exceed 5/8 inch. The maximum layer thickness of all passes, except cap passes, shall be limited to 1/4".
10. Requirements for workmanship and technique shall be as specified in AWS Code Sec. 3 and 4, including preheat and interpass temperatures, in accordance with Table 4.3 for process being used.
11. Preheat, if required by the following requirement, shall be used for all welds including tack welds. Preheat and interpass temperatures should be determined in accordance with AWS D1.1-94, Appendix XI, using the hydrogen controlled method, but shall not be less than the temperatures set forth in AWS D1.1-94 Table 4.3. [Welds for section in ASTM A6 Shape Size Groups 4 and 5 and plates with a thickness greater than 2-1/2 inches should have a minimum preheat of 350 degrees F]. To ensure that the work piece is properly heated, the temperature of the part shall be measured at a distance from the axis of the weld equal to twice the thickness of the thickest part being welded, but in no case less than 3 inches in all directions, including the through thickness dimension of the part being welded, for the full length of the weld joint. Preheat should be verified by the inspector before welding commences. [The cooling rate of the weldment should be controlled with thermal insulation or other appropriate methods to a maximum of 250 degrees F./hr.]

12. All welds shall be started and ended with a full cross-section weld for a minimum length of 1.5 times the joint thickness, but not less than one inch on weld tabs ("run off" tabs) except at access bores in beam/girder webs (see AWS D1.1, Section 3.12). All weld tabs should be removed, the affected area ground smooth and magnetic particle tested for defects.
13. If backing bars are used under the bottom beam flange to column flange CJP groove weld, the backing bar shall be removed, the removal area ground to sound, bright metal and the area magnetic particle tested for defects. A 5/16 inch fillet weld shall be placed in this location.
14. If a backing bar is used under the top beam flange to column CJP groove weld, and is not removed, the backing bar shall be attached to the column and beam flanges by either a fillet weld along the complete bar length on the under side of the bar, or by a partial penetration weld from the underside of the bar, for the full length of the bar. Other methods of welding the bar to the column and beam may be used subject to the Engineers approval.
15. Weld "dams" are not allowed. Weld "dams" are weld tabs not aligned in such a manner to provide an extension of the joint preparation per AWS D1.1, Section 3.12. Weld "dams" are typically perpendicular to proper weld tabs.
16. All tack welds shall be of the same quality as the final welds. This includes requirements for preheat. All tack welds not incorporated into the final welds shall be removed.
17. Groove welds shall be made with "stringer" passes only, no excessing weaving allowed. "Wash" passes will not be allowed. Lay passes in horizontal layers. Each pass shall be thoroughly de-slugged and cleaned. Individual weld beads shall be completed prior to applying portions of subsequent beads. Ends of interrupted passes in way of access holes shall be staggered.
18. Fillet welds terminating at ends or sides shall be returned continuously for distance at least twice normal size of weld (end returns).
19. Intermittent and continuous welding, and straightening of built-up sections shall be done in manner to minimize internal stresses.
20. Welds not specified shall be continuous fillet welds, sufficient to transmit required forces, using minimum fillet as specified by AWS D1.1, Table 2.2.
21. [In progress visual inspection per AWS D1.1-94 is required for all welding (fit-ups, cut-outs, clean-up, root passes, fill-in passes, etc.). Ultrasonic Testing (UT) is required for all (100%) complete joint penetration groove welds of beam-to-column welds, continuity plates welds and shear tabs.

## **2.4 SHOP PRIMING**

### **A. Shop prime steel surfaces, except the following:**

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.



- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
1. SSPC-SP 2 "Hand Tool Cleaning."
  2. SSPC-SP 3 "Power Tool Cleaning."
  3. SSPC-SP 5 "White Metal Blast Cleaning."
  4. SSPC-SP 6 "Commercial Blast Cleaning."
  5. SSPC-SP 7 "Brush-Off Blast Cleaning."
  6. SSPC-SP 8 "Pickling."
  7. SSPC-SP 10 "Near-White Blast Cleaning."
  8. SSPC-SP 11 "Power Tool Cleaning to Bare Metal."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 2.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

## **2.5 GALVANIZING**

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

## **2.6 SOURCE QUALITY CONTROL**

- A. Access to places where material for contract is being fabricated or produced shall be provided to Architect and/or testing laboratory for purpose of inspection.
- B. Architect may inspect structural steel at plant before shipment. However, Architect reserves right to reject any material, at any time before final acceptance, which does not conform to requirements of Drawings and Specifications.
- C. Furnished by General Contractor, as specified in this Section, unless otherwise noted.
1. Structural Steel Mill Manufacturer/Supplier.
  2. Structural Steel Fabricator.
  3. Structural Steel Erector.
  4. Manufacturer/Supplier of Structural products.
- D. Implement special inspection requirements in AWS D1.1-94, Sections 6.1 through 6.6. Contractor is required to furnish a fabrication/erection inspector. Owner will employ verification inspector. Visual inspection means that the inspectors visually inspect the welding for adherence to approved welding procedure specification starting with fit-up and proceeding through the welding process. Reliance only upon use of non-destructive examination (NDE) at end of the welding is not permitted. Use visual inspection in conjunction with NDE for sound weld.

- E. Inspection and testing by Owner's Agency is for verification and shall not relieve contractor of his responsibility to furnish materials and workmanship in accordance with Contract Documents.
- F. In cases of differences of opinion between owner's Inspector and the contractor's Inspector regarding conformance of a weld with the specifications, the issue should be brought to the owner's Engineer and the enforcement agency as part of the resolution process.

## **2.7 EXTENT OF QUALITY CONTROL**

- A. Contractor alone shall be responsible for correct fitting of structural members and for elevation and alignment of finished steel structure. General Contractor shall be responsible for establishing, setting and maintaining control points and building lines to be used in plumbing structural steel frame in accordance with AISC Code of Standard Practice, Section 7.11 and shall verify following:
  - 1. Verify that anchor bolts are located as specified on Drawings and are in proper relation to control points and building lines, prior to setting of structural steel.
  - 2. Verify that structural steel members have been located, elevated, plumbed, and aligned in relation to control points and building lines, within tolerance permitted by AISC Code of Standard Practice, Sec. 7.11. Any adjustments necessary in steel frame because of fabrication, construction or erection discrepancies in elevations and alignment shall be responsibility of Contractor.
- B. Structural Steel Fabricator/Erector shall provide quality control procedures to extent that he deems necessary to assure that fabrication work being performed and material or products being furnished, conform to Contract Documents, and to following extent:
  - 1. Visually inspect column material.
  - 2. Materials and products being furnished by Fabricator/Erector shall be received and identified in fabrication plant in such a manner that materials or products can be identified as being represented by mill test reports or manufacturer's certificates. Identification marks of materials shall remain on structural steel members through fabrication and erection.
  - 3. Inspect materials for compliance to ASTM A 6, prior to fabrication.
  - 4. Inspect installation of slip-critical High Strength Bolts and proper bolt tension, as follows:
    - a. When direct tension indicator method is used, observe installation of bolts to determine that bolt manufacturer's procedure is properly used and determine that correct indication of tension has been achieved.
  - 5. Visually inspect to confirm that plies of connected elements have been brought into firm contact.
  - 6. Visually inspect welds as specified in AWS Code, Section 6.
- C. Product Manufacturer/Supplier of structural items shall inspect and test products as specified in designated ASTM Specifications; reference Submittals, this Section.

- D. Structural Steel Mill/Manufacturer shall inspect and test materials as specified in designated ASTM Specifications and perform ultrasonic testing of materials required of Steel Mill Supplier, as specified in this Section; Reference submittals, this Section.
- E. Structural Steel Fabricator/Erector shall provide quality control procedures during erection to extent that he deems necessary to assure that erection work being performed conforms to Contract Documents and to following extent:
  - 1. Visually inspect welds as specified in AWS D1.1, 6.1 through 6.6.
  - 2. Inspect installation of direct tension indicators at bolted slip-critical connections.
  - 3. Perform bend test on shear studs as specified in accordance with AWS Code Section 4.25.
- F. Adjustments necessary in steel frame because of fabrication, construction or erection discrepancies in elevations and alignment shall be responsibility of Contractor.
- G. Survey Work:
  - 1. Contractor shall employ at his expense registered professional engineer or surveyor to establish control points and layout work for Building Control Lines. Steel Contractor shall conduct layout work and elevations for erection of structural steel.
  - 2. Check elevations of concrete and masonry bearing surfaces and anchor bolt locations prior to erection and submit discrepancies to Architect/Engineer prior to start of erection. Corrections or adjustments to structural steel shall be made and submitted for approval prior to start of erection.
  - 3. Upon completion of erection of steel frame and before start of work by other trades that are supported, attached or applied to frame, General Contractor shall make a final survey of frame and submit report certifying compliance with specified tolerances.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Templates shall be securely in place to preclude misplacements of anchor bolts, and bolts shall be installed at locations and with projections established by approved structural steel shop drawings.
- B. General Contractor and Structural Erection Contractor shall separately check and agree on correct positioning before concrete is placed.
- C. Subsequent displacement of anchor bolts will be responsibility of General Contractor.

### **3.2 ERECTION**

- A. General:
  - 1. Contractor shall completely outline proposed method and sequence of erection to Architect for approval before delivering material to jobsite.
  - 2. Outline shall be prepared to avoid delay of any damage to work of other trades.

3. Contractor shall comply with state, local and Federal laws pertaining to safety requirements for steel erection.
4. Erection of structural steel members shall be in accordance with AISC Specification and AISC Code of Standard Practice, and as follows.

B. Column Base Plates and Bearing Plates:

1. Columns with base plates attached and bearing plates for beams and similar structural members shall be set level to their proper alignment and elevation using shim packs unless noted otherwise.
2. Loose column bases are to be set level to their proper alignment and elevation by use of shim packs, leveling bolts or as indicated on Structural Drawings.

C. Erection Tolerances:

1. Each individual member shall be erected, plumbed, leveled and aligned within tolerance defined in Sec. 7.11 and Commentary of AISC Code of Standard Practice, except as noted. Top surface of closure angles/plates at building perimeter and at openings shall be within 1/4 inch of their proper location prior to commencement of concreting operations. Where this condition is not satisfied, 18 gage plate shall be attached to angles/plates in manner sufficient to serve as guide for strikeoff of concrete floor surface.
2. Building lines for use in plumbing exterior columns shall be established by General Contractor. As erection progresses, General Contractor shall be responsible for accuracy of building lines off-set, maintaining and referencing building lines required to verify plumbness of structural steel framing.
3. Elevation tolerance at beams and girders at columns to be +3/16" to -5/16" per AISC.

D. Field Erection:

1. Erect members according to most economical method and sequence available consistent with Plans and Specifications.
  - a. The structure is considered a "Non-Self Supporting Steel Frame" as defined by Section 7.9.3 in the AISC Code of Standard Practice.
2. As erection progresses, provide temporary guy lines to properly align steel framing.
3. Align various members accurately to lines and elevations indicated within specified erection tolerances.
4. Make adjustments to various members prior to making permanent connections.
5. Temporary guying or bracing shall be introduced wherever necessary to take care of loads to which structure may be subjected. This bracing shall be left in place as required by erection procedures. Adequacy of temporary bracing shall be sole responsibility of Contractor.
6. This work shall be permanently connected as required by Structural Drawings or final shop drawings in a sequence that will minimize lock-in stress.
7. Drift pins shall not be used to enlarge unfair holes in main material. Burning and drifting may be used to align unfair holes in secondary bracing members only upon approval of Architect. Ream holes that must be enlarged to admit bolts.

8. High strength bolted connections shall be in accordance with this Section, Part 2.
9. Welded construction shall be in accordance with this Section, Part 2.

E. Installation of Automatic End Welded Stud for Shear Connectors or Headed Stud Anchors for Concrete:

1. Areas to which studs are to be attached must be free of foreign material, such as rust, oil, grease, paint, etc. When mill scale is sufficiently thick to cause difficulty in obtaining proper welds, it must be removed by grinding or sandblasting.
2. Studs shall be automatically end welded in accordance with manufacturer's recommendations in such manner as to provide complete fusion between end of stud and plate. There should be no porosity or evidence of lack of fusion between welded end of stud and plate. Stud shall decrease in length during welding approximately 1/8 inch for 5/8 inch and under, and 3/16 inch for over 5/8 inch diameter. Welding shall be done only by qualified welders approved by welding inspector. Length of studs shown on drawings is length after welding.
3. Ceramic ferrules used in stud welding process shall be completely removed from area where concrete is to be placed.

F. Grouting of Base Plates and Bearing Plates:

1. Plates shall be set and anchored to proper line and elevation. Metal wedges, shims, and/or setting nuts shall be used for leveling and plumbing structural members, including plumbing of columns. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance, and shall be damp. Metal surfaces shall be clean and free of oil, grease, and rust. Addition of water, mixing and placing, shall be in conformance with material manufacturer's instructions. Grout shall be mixed by using a mortar mixer. Batches shall be of size to allow continuous placement of freshly mixed grout. Placing shall be quick and continuous. Exposed surfaces shall have smooth, dense finish.
2. Base plates shall be grouted prior to placement of structural concrete slabs.

G. Clean-Up:

1. Upon completion of erection, Contractor shall remove falsework used by him.

### **3.3 FIELD QUALITY CONTROL**

A. Owner will employ and pay a qualified independent testing agency to perform following testing for field quality control, including special inspections required by local building code. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Scope of Services:

1. Testing Laboratory will furnish qualified Inspectors as duly designated persons who act in behalf of Architect/Owner on inspection and quality matters within scope of AWS Code D1.1. to ascertain that fabrication and erection by welding is performed in accordance with requirements of AWS Code D1.1.

2. Testing Laboratory will furnish qualified Inspectors for inspection of Fabricator/Erector's quality control procedures, materials and workmanship required of Owner's/Purchaser's representatives, as specified in AISC Specification M5. Such inspections are to be made to fullest extent possible in Fabricator's plant.
3. Testing Laboratory will furnish qualified Inspectors and technicians to perform inspections and tests as specified herein, interpret results and report deviations from Contract Documents.

C. Qualification of Personnel:

1. Personnel performing non-destructive testing will be qualified in accordance with current edition of American Society for Non-Destructive Testing Recommended Practice No. SNT-TC 1A. Only individuals qualified for NDT Level I and working under NDT Level II, or individuals qualified for NDT Level II may perform non-destructive testing specified.
2. Personnel performing inspections of welding work will be currently registered with American Welding Society as having successfully complied with requirements of Section 4 of A.W.S. Standards for Qualification and Certification of Welding Inspectors, QC1 may perform welding inspection specified.

D. Reports of Inspection and Tests:

1. Fabrication and Erection reports shall be issued on a weekly basis, or as conditions warrant, and will include following information:
  - a. Progress of work
  - b. Location and progress of inspections.
  - c. Results of inspections, noting any deviations from Contract Documents.
  - d. Correction of deviations.
2. Non-destructive testing reports will include following information:
  - a. Reports shall be issued on suggested AWS (Appendix E) or similar forms containing same information.
  - b. Interpret test results and state in test report whether or not test specimen conforms to Contract Documents.
3. Submit certified copies of tests and inspections to following:
  - a. Owner (2)
  - b. Architect (1)
  - c. Engineer (1)
  - d. Contractor (2)
  - e. Fabricator (1)
  - f. Erector (1)

E. Shop Inspection and Testing of Materials:

1. Check Certified Mill Test Reports to verify structural steel being furnished conforms to appropriate ASTM Specification.

2. Verify following products being furnished are represented by manufacturer's certifications and test data.
  - a. High Strength bolts.
  - b. Filler metal for welding.
  - c. Shear studs used as shear connectors.
  - d. Direct tension indicators.
  - e. Tension Control Bolts

F. Shop Inspection of High-Strength Bolted Connections:

1. Inspection will be performed in accordance with AISC Specification for Structural Joints Section 9, to following extent:
  - a. Observe installation of bolts to verify bolts have been properly installed and tightened to selected procedure of AISC Specification for Structural Joints Section 8(c). or 8(d).
  - b. When direct tension indicator method is used, observe installation of bolts to determine that DTI manufacturer's procedure is properly used and determine that correct indication of tension has been achieved.

G. Shop Inspection of Welding:

1. Testing laboratory will obtain from fabricator and erector names of welders to be employed on Work, together with certification that each of these welders has passed qualification tests within last year using procedures covered in American Welding Society Standard D1.1 and as specified in Paragraph 1.3.B.
2. Inspection of welding work will be performed as specified in AWS Code Section 6, and to following extent:
  - a. Visual inspection of welds as specified in AWS Code, Sec. 6.5.
  - b. Inspection of welding procedures as specified in AWS Code, Sec. 6.3.
  - c. Inspection of welder's qualification as specified in AWS Code, Sec. 6.4.
3. Perform ultrasonic testing of complete penetration groove welds for entire weld length, in each designated joint, in accordance with AWS Code, Sec. 6, Part C, and to following extent:
  - a. 100 percent of welds splicing beams, girders, columns and braces[ where shown on drawings].
  - b. 100 percent of column to base plate welds at rigid frame columns only.
  - c. 100 percent of frame columns from 6" above joint to 6" below joint before and after welding connections.
  - d. 100 percent of complete joint penetration groove welds of beam-to-column welds, continuity plate welds and shear tabs.

H. Field Inspection of Alignment and Fit-Up:

1. Verify location and setting of anchor bolts by witness of Contractor's final check prior to setting of steel members.

2. As erection progresses, check connection of members for proper fit-up and adjustment prior to making permanent connections.
3. Verify plumbness of columns is within allowable tolerance specified in AISC Code Sec. 7.11 and Commentary.
4. Verify that bracing and guying/cables, if required to secure steel framing during erection, are installed in accordance with erection procedures.
5. During erection, verify specified phases of construction and steel erection are complete in accordance with erection procedure before proceeding with additional erection of structural steel.

I. Field Inspection of High-Strength Bolted Connections:

1. Bolts will be inspected as specified in Para. 3.3/F, Shop Inspection of High-Strength Bolted Connections to following extent:
  - a. Each bolt in each slip-critical connection shall be inspected as specified above.
  - b. Two bolts in each bearing type bolted connection between girders and columns shall be inspected as specified above.
  - c. 10 percent of remainder of bolts, but not less than 2 in each connection, shall be inspected as specified above.
2. Bolted connections that fail shall be retightened and remaining bolts in connection shall be retested. Cost of retests on connections that fail shall be borne by Contractor.

J. Field Inspection of Welding Work:

1. Testing laboratory will obtain from fabricator and erector names of welders to be employed on Work, together with certification that each of these welders has passed qualification tests within last year using procedures covered in American Welding Society Standard D1.1 and as specified in Paragraph 1.3.B.
2. Visual inspection and non-destructive examination of welding work will be performed as specified in Para 3.3/G., Shop Inspection of Welding.
3. Visually inspect the welding for adherence to approved welding procedure specification starting with fit-up and proceeding through the welding process as the welding is being performed. Follow up visual inspection with non-destructive examination.
4. Base metal thicker than 1-1/2 inches shall be ultrasonically inspected for discontinuities directly behind weld after joint completion. Any material discontinuities shall be accepted or rejected on basis of defect rating in accordance with (larger reflector) criteria of U.B.C. Standard No. 27-6.
5. Ultrasonically test full-penetration, moment connection welds in accordance with AWS Code, Sec. 6, Part C, to following extent:
  - a. 25 percent of welds made by each individual welder shall be tested at random as specified above.
  - b. If an unacceptable weld is found, two additional welds made by same welder shall be tested at random. If either of these welds are found unacceptable, 100 percent of same welder's welds shall be tested as specified above and



welder shall be recertified by Testing Laboratory, in accordance with qualification tests specified in AWS Code, Sec. 5, Part B, before being allowed to continue welding on this project.

- c. Test each weld in moment connection as specified above.
6. Extent of testing shall be entire weld length in each designated joint.
7. All groove welds in the steel moment frame girder-to-column connection should be ultrasonically (UT) examined for the full length. Backing bar removal areas and fillet welds on continuity plates should be examined for the full length by the magnetic particle testing (MPT) method.
8. Welds found unacceptable shall be repaired by methods permitted by AWS Code, Sec. 3.7, and reinspected by ultrasonic testing. Cost of initial test and further testing shall be borne by Contractor.

K. Field Inspection of Shear Studs used as Shear Connectors:

1. Inspect number and locations of shear studs for conformity to Structural Drawings.
2. Inspection of shear stud welding will be in accordance with AWS Code, Chapter 7 and as follows:
  - a. Visual inspection of shear studs shall indicate complete fusion and full 360 degrees flash weld. There will be no indication of lack of fusion.
  - b. If, after welding, visual inspection reveals that a sound weld or full 360 degree flash weld has not been obtained, each stud shall be bent by hammering stud to an angle of 15 degrees from its original axis. Direction of bending shall be opposite missing flash weld. Studs that crack in weld, base metal, or shank shall be replaced.
  - c. Minimum of two (2) studs shall be welded at start of each production period in order to determine proper generator, control unit and stud welder setting. These studs shall be capable of being bent 45 Deg. from vertical without weld failure. After above test, weld section shall not exhibit tearing out or cracking.
  - d. In addition to above, six members per floor per building quadrant shall be selected at random on which 5 studs shall be hammered 15 degrees toward center of member. NOT MORE THAN ONE STUD SHALL SHOW ANY SIGN OF FAILURE. If two or more studs fail, remaining studs on member shall be hammered. Studs showing any sign of failure shall be replaced. For each beam with any defective studs, additional beam shall be tested.

L. Base Plate Grout:

1. For every ten (10) base plates grouted, grout strength will be tested with set of cubes as follows:
  - a. Set of cubes will consist of two cubes to be tested at 7 days, and two cubes to be tested at 28 days.
  - b. Test cubes will be made and tested in accordance with Corps of Engineers Specification for Non-Shrink Grout, CRD-C621, with exception that grout should be restrained from expansion by top plate.

### **3.4 CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.5 mils.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

**END OF SECTION**

**SECTION 05 5213  
PIPE AND TUBE RAILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.
- D. Balcony railings and guardrails.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 05 5100 - Metal Stairs: Attachment plates for handrails specified in this section.
- C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- D. Section 09 9113 - Exterior Painting: Paint finish.
- E. Section 09 9123 - Interior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).
- G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
- H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

**PART 2 PRODUCTS**

**2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.

- E. Dimensions: See drawings for configurations and heights.
- F. Provide anchors and other components 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 or welding anchors.
  - 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting or welding anchors.
  - 3. For anchorage to stud walls, provide backing plates, for bolting or welding anchors.
- G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

## **2.02 STEEL RAILING SYSTEM**

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.
- C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- E. Exposed Fasteners: No exposed bolts or screws.
- F. Straight Splice Connectors: Steel concealed spigots.
- G. Galvanizing: In accordance with requirements of ASTM A123/A123M.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

## **2.03 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  - 2. Interior Components: Continuously seal joined pieces by continuous welds.
  - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

### **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.

**END OF SECTION**

## SECTION 053100 - STEEL DECKING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Roof deck.

##### B. Related Requirements:

1. Section 035216 "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data:

1. Roof deck.

##### B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

##### C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Certificates:

1. Welding certificates.
2. Product Certificates: For each type of steel deck.

##### B. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
  - a. Power-actuated mechanical fasteners.
  - b. Acoustical roof deck.

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2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.
  - C. Field Quality-Control Submittals:
    1. Field quality-control reports.
  - D. Qualification Statements: For welding personnel and testing agency.
- 1.4 QUALITY ASSURANCE
- A. Qualifications:
    1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
      - a. AWS D1.1/D1.1M.
      - b. AWS D1.3/D1.3M.
  - B. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its "RoofNav" for Class 1 fire rating and Class 1-[60] [75] [90] windstorm ratings. Identify materials with FM Approvals Certification markings.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
  - B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
    1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

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- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

## 2.2 ROOF DECK

- A. Basis-of-Design Product: Subject to compliance with requirements, provide New Millennium Building Systems, LLC; **Deep-Dek 7.5** Roof Deck or comparable product by one of the following:
  - 1. ASC Profiles, Inc.
  - 2. Canam Steel Corporation; Canam Group, Inc.
  - 3. Epic Metals Corporation.
  - 4. Marlyn Steel Decks, Inc.
  - 5. Vulcraft; Nucor Vulcraft Group.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
  - 1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on primer.
    - a. Color: Manufacturer's standard.
  - 2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 40 zinc coating.
  - 3. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 40 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on primer.
    - a. Color: Manufacturer's standard.
  - 4. Deck Profile: Long span.
  - 5. Profile Depth: As indicated.
  - 6. Design Uncoated-Steel Thickness: 0.0474 inch.
  - 7. Span Condition: As indicated.
  - 8. Side Laps: Overlapped.
  - 9. Hanger Tabs: Rolled-in Type B.

## 2.3 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.



- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth. Not less than 0.0359-inch design uncoated thickness unless noted otherwise; and supplied with minimum G60 zinc coating.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- J. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

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1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.
- J. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

### 3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
  1. Weld Diameter: 5/8 inch, nominal.
  2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
  3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
  1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
  1. End Joints: Butted.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
  1. Install reinforcing channels in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.

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1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.
- G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified.

### 3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
1. Wire brush and clean rust spots, welds, and abraded areas on Both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
  3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
    - a. Field welds will be subject to inspection.
  2. Steel decking will be considered defective if it does not pass tests and inspections.
  3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
    - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.
- C. Prepare test and inspection reports.

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END OF SECTION 053100

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**SECTION 05 4000  
COLD-FORMED METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Formed steel joist and purlin framing and bridging.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 3100 - Steel Decking.
- B. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.
- C. Section 07 2100 - Thermal Insulation: Insulation within framing members.
- D. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.
- E. Section 07 9200 - Joint Sealants.
- F. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.
- G. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.
- H. Section 31 3116 - Termite Control: Field-applied termiticide and mildewcide for metal framing.

**1.03 REFERENCE STANDARDS**

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members 2012.
- 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 2022.
- D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.
- E. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members 2018, with Editorial Revision.
- F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.
- G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 2004.
- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Framing:
  - 1. ClarkDietrich Building Systems:
  - 2. Marino:

3. SCAFCO Corporation:
  4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Framing Connectors and Accessories:
1. Same manufacturer as metal framing.
  2. Simpson Strong Tie: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
  3. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 FRAMING SYSTEM**

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
  2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
  3. Design Loads: In accordance with applicable codes.
  4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
  5. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- C. Shop fabricate framing system to the greatest extent possible.
- D. Deliver to site in largest practical sections.

## **2.03 FRAMING MATERIALS**

- A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
1. Gage and Depth: As required to meet specified performance levels.
  2. Painted finish.
- B. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.
- C. Framing Connectors: Factory-made, formed steel sheet.
1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
  2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
  3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
    - a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
    - b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
  4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

## **2.04 WALL SHEATHING**

- A. Gypsum Board Wall Sheathing: See Section 09 2116.

- B. Gypsum board; complying with requirements of ASTM C1396/C1396M for gypsum sheathing, V-shaped long edges, 5/8 inch thick, Type X - Fire Resistant
- C. Extruded polystyrene (XPS) board insulation, ASTM C578, Type IV, tongue and groove along edges; 3/4 inch thick.

## **2.05 ACCESSORIES**

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

### **3.02 INSTALLATION OF STUDS**

- A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

### **3.03 INSTALLATION OF JOISTS AND PURLINS**

- A. Install framing components in accordance with manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.

### **3.04 INSTALLATION OF WALL SHEATHING**

- A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
  - 1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.

**END OF SECTION**

## **SECTION 06 1000 ROUGH CARPENTRY**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Fire retardant treated wood materials.
- B. Miscellaneous framing and sheathing.
- C. Communications and electrical room mounting boards.
- D. Concealed wood blocking, nailers, and supports.
- E. Miscellaneous wood nailers, furring, and grounds.

#### **1.02 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood 2022.
- D. PS 1 - Structural Plywood 2019.
- E. PS 20 - American Softwood Lumber Standard 2021.

#### **1.03 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
  - 2. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

#### **2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

#### **2.03 CONSTRUCTION PANELS**

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

#### **2.04 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.

#### **2.05 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWPA 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.

B. Fire Retardant Treatment:

### **PART 3 EXECUTION**

#### **3.01 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.

#### **3.02 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

#### **3.03 INSTALLATION OF CONSTRUCTION PANELS**

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  3. Install adjacent boards without gaps.

#### **3.04 CLEANING**

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

**SECTION 07 1400**  
**FLUID-APPLIED WATERPROOFING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fluid-Applied Waterproofing:
  - 1. Polyurethane waterproofing.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal counterflashings.
- C. Section 07 9200 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not part of work in this section.

**1.03 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course 2018 (Reapproved 2022).
- C. ASTM C1306/C1306M - Standard Test Method for Hydrostatic Pressure Resistance of a Liquid-Applied Waterproofing Membrane 2008, with Editorial Revision (2016).
- D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).
- E. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact 2020.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).
- G. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers 2022.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- I. 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 (Reapproved 2019).
- J. NRCA (WM) - The NRCA Waterproofing Manual 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Warranty:
  - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
  - 2. Submit installer's certification that installation complies with warranty conditions for the waterproofing membrane.

## **1.05 MOCK-UP**

- A. Construct mock-up consisting of 100 sq ft of horizontal waterproofed panel; to represent finished work including internal and external corners, drainage panel, base flashings, control joints, expansion joints, counterflashings, and protective cover.
- B. Locate where directed.
- C. Mock-up may remain as part of this Work.

## **1.06 FIELD CONDITIONS**

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Polyurethane Waterproofing:

#### **2.02 WATERPROOFING APPLICATIONS**

- A. Polyurethane Waterproofing:

#### **2.03 FLUID APPLIED WATERPROOFING MATERIALS**

- A. Polyurethane Waterproofing: Cold-applied one or two component polyurethane, complying with ASTM C836/C836M.
  - 1. Cured Thickness: 60 mils, 0.060 inch, minimum.
  - 2. Suitable for installation over concrete substrates.
  - 3. VOC Content: None.
  - 4. Tensile Strength: 400 psi, measured in accordance with ASTM D412.
  - 5. Ultimate Elongation: 180 percent, measured in accordance with ASTM D412.
  - 6. Durometer Hardness, Type A: 30, minimum, in accordance with ASTM D2240.
  - 7. Adhesion: Greater than 150 psi, measured in accordance with ASTM D4541.
  - 8. Brittleness Temperature: Based on minus 50 degrees F, measured in accordance with ASTM D746.
  - 9. Products:
    - a. Carlisle Coatings & Waterproofing, Inc; CCW 703 Liquiseal:
    - b. Gaco Western; GacoFlex LM-60:
    - c. Tremco Commercial Sealants & Waterproofing; TREMproof 250GC:

#### **2.04 ACCESSORIES**

- A. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.
- B. Counterflashings: As recommended by membrane and protection board manufacturer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
- C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

#### **3.02 PREPARATION**

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.
- D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

### **3.03 INSTALLATION**

- A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.
- B. Seal membrane and flashings to adjoining surfaces.

### **3.04 FIELD QUALITY CONTROL**

- A. Owner will provide testing services in accordance with Section 01 4000 - Quality Requirements.  
Contractor shall provide temporary construction and materials for testing.

### **3.05 PROTECTION**

- A. Do not permit traffic over unprotected or uncovered membrane.

**END OF SECTION**

## **SECTION 07 1900 WATER REPELLENTS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Water repellents applied to exterior masonry surfaces.

#### **1.02 REFERENCE STANDARDS**

- A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units 2022c.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

#### **1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. 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 Water Repellent Material: Two gallons of type installed.

#### **1.04 QUALITY ASSURANCE**

#### **1.05 MOCK-UP**

- A. Prepare a representative surface 36 inch by 36 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

#### **1.06 FIELD CONDITIONS**

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

#### **1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

#### **1.08 PART 2 PRODUCTS**

#### **1.09 MANUFACTURERS**

- A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
  - 1. BASF Construction Chemicals:
  - 2. Pecora Corporation; Klere Seal 910W:
  - 3. PPG Paints:
  - 4. PROSOCO, Inc:
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

#### **1.10 MATERIALS**

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
  - 2. Number of Coats: Two.

3. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete and masonry.
  - a. Products:
    - 1) BASF Construction Chemicals:
    - 2) Pecora Corporation:
    - 3) PROSOCO, Inc;
    - 4) Substitutions: See Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **2.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

### **2.02 PREPARATION**

- A. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- B. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- C. Remove loose particles and foreign matter.
- D. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- E. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

### **2.03 APPLICATION**

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply two coats, minimum.
- C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

## **END OF SECTION**

## **SECTION 07 2100 THERMAL INSULATION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Board insulation at cavity wall construction, perimeter foundation wall, over roof deck, and exterior wall behind masonry wall finish.
- B. Batt insulation in exterior ceiling construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
- D. Sound Attenuation Batt insulation where noted on partition schedule.
- E. Expanding spray foam insulation.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.
- B. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.
- C. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.
- D. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.
- E. Section 07 51 10 - Multi-Ply Cold Process Roof.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2022.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- F. FM DS 1-28 - Wind Design 2015, with Editorial Revision (2022).

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

#### **1.05 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Thermal Insulation:
  - 1. Owens-Corning
  - 2. BASF
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Expanding Spray Foam Insulation
  - 1. Dow Great Stuff
  - 2. Locktite Tight Foam

## 2.02 APPLICATIONS

- A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board with vapor barrier
- D. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- E. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.
- F. Insulation over roof deck Extruded polystyrene (XPS) board.

## 2.03 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
  - 4. Board Edges: Square.
  - 5. Manufacturers:
    - a. Dow Chemical Company; STYROFOAM HIGHLOAD 40:
    - b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation:
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 4. Board Size: As noted or industry standard.
  - 5. Board Thickness: as noted on drawings.
  - 6. Board Edges: Square.
  - 7. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
  - 8. Manufacturers:
    - a. DuPont de Nemours, Inc; STYROFOAM Brand CAVITYMATE Ultra:  
[www.building.dupont.com/#sle](http://www.building.dupont.com/#sle).

## 2.04 BATT INSULATION MATERIALS

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
  - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
  - 4. Manufacturers:
    - a. CertainTeed Corporation:
    - b. Johns Manville:
    - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation:
- C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
  - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.



2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Manufacturers:
  - a. Johns Manville; MinWool Sound Attenuation Fire Batts:
  - b. Thermafiber, Inc; SAFB:
  - c. Thermafiber, Inc; SAFB FF:
  - d. Substitutions: See Section 01 6000 - Product Requirements.

## **2.05 ACCESSORIES**

- A. Sheet Vapor Retarder: Specified in Section 07 2500.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### **3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER**

- A. Install boards horizontally on foundation perimeter.
  1. Place boards to maximize adhesive contact.
  2. Install in running bond pattern.

### **3.03 BOARD INSTALLATION AT EXTERIOR WALLS**

- A. Install boards horizontally on walls.
  1. Install in running bond pattern.
- B. Extend boards over expansion joints, unbonded to wall on one side of joint.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.04 BOARD INSTALLATION AT CAVITY WALLS**

- A. Secure impale fasteners to substrate at following frequency:
  1. Six (6) per insulation board.
- B. Install boards to fit snugly between wall ties.
  1. Place membrane surface facing out, and tape seal board joints.
- C. Install boards horizontally on walls.
  1. Install in running bond pattern.
  2. Butt edges and ends tightly to adjacent boards and to protrusions.
  3. Place impale fastener locking discs.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.05 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK**

- A. Board Installation Over Roof Deck, General:
  1. See applicable roofing specification section for specific board installation requirements.
  2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
  3. Do not apply more insulation than can be covered with roofing in same day.

### **3.06 BATT INSTALLATION**

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in wall and ceiling spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches on center.
- G. Tape insulation batts in place.
- H. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- I. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
- J. Tape seal tears or cuts in vapor retarder.

### **3.07 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

**SECTION 07 2400**  
**EXTERIOR INSULATION AND FINISH SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Composite wall cladding of rigid insulation and reinforced finish coating ("Class PB").
- B. Drainage and water-resistive barriers behind insulation board.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 4000 - Cold-Formed Metal Framing: Sheathing on metal studs.
- B. Section 06 1000 - Rough Carpentry: Sheathing on wood framing.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Perimeter flashings.
- D. Section 07 9200 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.

**1.03 REFERENCE STANDARDS**

- A. ASTM C150/C150M - Standard Specification for Portland Cement 2022.
- B. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions 2016.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.
- D. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage 2013 (Reapproved 2019).
- E. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive 2022.
- F. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity 2015 (Reapproved 2020).
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- K. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
- L. ASTM E2485/E2485M - Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings 2013 (Reapproved 2018).
- M. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS) 2022.
- N. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems 2009, with Editorial Revision (2014).
- O. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies 2009, with Editorial Revision (2012).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall and soffit joint patterns, joint details, and molding profiles.
- D. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.
- E. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures.
- F. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

#### **1.05 MOCK-UP**

- A. Construct mock-up of typical EIFS application on specified substrate, size as required to include examples of all key conditions, and including flashings, joints, and edge conditions.
- B. Locate mock-up where directed.
- C. Mock-up may remain as part of the Work.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 10 years.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of Design:
  - 1. Dryvit Systems, Inc; Dryvit Outsulation Plus MD EIFS, Class PB with Moisture Drainage: [www.dryvit.com/#sle](http://www.dryvit.com/#sle).
- B. Other Acceptable Manufacturers:
  - 1. Parex USA, Inc; Standard WaterMaster EIFS with Moisture Drainage: [www.parex.com/#sle](http://www.parex.com/#sle).
  - 2. Sto Corp; StoTherm ci XPS: [www.stocorp.com/#sle](http://www.stocorp.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 EXTERIOR INSULATION AND FINISH SYSTEM**

- A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on flat-backed insulation board adhesive-applied directly to water-resistive coating over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.
- B. Fire Characteristics:
  - 1. Flammability: Pass, when tested in accordance with NFPA 285.

2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
  3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot.
- C. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi, when tested in accordance with ASTM C297/C297M.
  - D. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi in all samples.
  - E. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
  - F. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
  - G. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.
  - H. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
  - I. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
  - J. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
  - K. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.
  - L. Impact Resistance: Construct system to provide the following impact resistance without exposure of broken reinforcing mesh, when tested in accordance with ASTM E2486/E2486M:
    1. Standard: 25 to 49 in-lb, for areas not indicated as requiring higher impact resistance.
    2. Ultra-High: Over 150 in-lb, for covered canopy drop off columns..

## 2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
  1. Texture: Medium.
- B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh.
- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578, with natural skin surfaces.
  1. Board Size: 48 by 96 inch.
  2. Board Size Tolerance: 1/16 inch from square and dimension.

3. Board Thickness: As indicated on drawings.
  4. Type and Thermal Resistance, R-value (RSI-value): Type X, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
  5. Type and Compressive Resistance: Type X, 15 psi (104 kPa), minimum.
  6. Type and Board Density: Type X, 1.30 pcf (21 kg/cu m), minimum.
  7. Type and Water Absorption: Type X, 0.3 percent by volume, maximum, by total immersion.
  8. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, when tested in accordance with ASTM E84.
- E. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.

## **2.04 ACCESSORY MATERIALS**

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Insulation Fasteners: Fastener and plate system appropriate for substrate and as recommended by EIFS manufacturer.
- C. Metal Flashings: As specified in Section 07 6200.
- D. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- E. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

### **3.02 INSTALLATION - GENERAL**

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
  1. Where different requirements appear in either document, comply with the most stringent.
  2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

### **3.03 INSTALLATION - WATER-RESISTIVE BARRIER**

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Mechanically attach sheet materials to substrate using fasteners and fastener spacing recommended by EIFS manufacturer.
- C. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- D. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- E. At moving expansion joints, apply flexible flashing or flashing tape across and recessed into joint with U-loop forming continuous barrier but allowing movement.
- F. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.
- G. Install drainage layer or spacers after flashing tape has been completed.

### **3.04 INSTALLATION - INSULATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- C. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.
- D. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.
- E. Rasp irregularities off surface of installed insulation board.

### **3.05 INSTALLATION - CLASS PB FINISH**

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
  - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
  - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours and finish to a uniform texture and color.
- C. Finish Coat Thickness: As recommended by manufacturer.
- D. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

### **3.06 CLEANING**

- A. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

### **3.07 PROTECTION**

- A. Protect completed work from damage and soiling by subsequent work.

**END OF SECTION**

## **SECTION 07 2500 WEATHER BARRIERS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Water-resistive barriers.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.
- B. Section 07 2400 - Exterior Insulation and Finish Systems: Water-resistive barrier under exterior insulation.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

#### **1.03 DEFINITIONS**

- A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

#### **1.04 REFERENCE STANDARDS**

- A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure 2018, with Editorial Revision (2019).
- B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds 1998 (Reapproved 2017).
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.
- D. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay 2017 (Reapproved 2021).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- G. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.
- H. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies 2018.
- I. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers 2016, with Editorial Revision (2019).
- J. ICC-ES AC208 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing 2015.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.



## **PART 2 PRODUCTS**

### **2.01 WATER-RESISTIVE BARRIER MATERIALS**

- A. Water-Resistive Barrier Coating: Fluid applied, UV-resistant coating for use over various types of exterior sheathing, CMU, and precast concrete in accordance with ICC-ES AC212.
  - 1. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
  - 2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
  - 3. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
  - 4. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
  - 5. Joint Preparation Treatment: As recommended by coating manufacturer.
  - 6. Products:
    - a. PROSOCO, Inc; Spray Wrap MVP:
    - b. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 ACCESSORIES**

- A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
- C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
  - 1. Width: 4 inches.
  - 2. Products:
    - a. DuPont de Nemours, Inc; FlexWrap:
    - b. SIGA Cover Inc; SIGA-Wigluv:
    - c. Substitutions: See Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces and conditions comply with requirements of this section.

### **3.02 PREPARATION**

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

### **3.03 INSTALLATION**

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Coatings:
  - 1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
  - 2. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.
- D. Openings and Penetrations in Exterior Water-Resistive Barriers:
  - 1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

**END OF SECTION**

**SECTION 07 4113  
METAL ROOF PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal roof panel system of preformed steel panels.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 2100 - Thermal Insulation: Rigid roof insulation.
- B. Section 07 4213 - Metal Wall Panels: Preformed wall panels.
- C. Section 07 9200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

**1.03 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM A463/A463M - Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process 2022.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- H. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings 2020a.
- I. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference 2005 (Reapproved 2017).
- J. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference 1995 (Reapproved 2018).
- K. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems 2016 (Reapproved 2022).
- L. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments 2012, with Editorial Revision (2015).
- M. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Storage and handling requirements and recommendations.
  - 2. Installation methods.
  - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.

1. Show work to be field-fabricated or field-assembled.
- D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
- E. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- F. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

#### **1.06 MOCK-UPS**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Locate as directed by Architect.
- C. Mock-up may remain as part of the work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

#### **1.08 FIELD CONDITIONS**

- A. Do not install metal roof panels, eave protection membrane or underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

#### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Architectural Metal Roof Panel Manufacturers:
  1. Berridge Manufacturing Company; Cee-Lock Panel:
  2. Metal Roofing Systems, Inc; System 2000 - Metal Roof Panels:
  3. Sheffield Metals International; SMI 1.75" SnapLock Standing Seam:
  4. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 PERFORMANCE REQUIREMENTS**

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
  1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
  2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
  3. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
  4. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.

5. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

### **2.03 METAL ROOF PANELS**

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
  1. Steel Panels:
    - a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
    - b. Steel Thickness: Minimum 22 gauge.
  2. Profile: Standing seam, with minimum 1-1/2-inch seam height; concealed fastener system for snap-on application of matching standing seam batten.
  3. Texture: Smooth, with intermediate ribs for added stiffness.
  4. Length: Maximum possible length to minimize lapped joints. Where lapped joints are unavoidable, space laps so that each sheet spans over three or more supports.
  5. Width: Maximum panel coverage of 24 inches.

### **2.04 ATTACHMENT SYSTEM**

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

### **2.05 FABRICATION**

- A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

### **2.06 FINISHES**

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.
  1. Products:
    - a. Arkema, Inc; Kynar 500:
    - b. PPG; Duranar:
    - c. Sherwin-Williams Company; Fluoropon:
    - d. Substitutions: See Section 01 6000 - Product Requirements.

### **2.07 ACCESSORIES**

- A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
  1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
  3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

- D. Underlayment: Self-adhering polymer modified sheet; 20 mil total thickness; with strippable siliconized release film on bottom side and slip resistant and UV-stable facing on top side.
  - 1. Water Vapor Permeance: 30 perm, maximum, when tested in accordance with ASTM E96/E96M, Desiccant Method A.
  - 2. Products:
    - a. Certainteed Roofing; DryRoof SA - Self-Adhered:
    - b. VaproShield, LLC; SlopeShield Plus Self-Adhered:
    - c. Substitutions: See Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.
- B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- D. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

### **3.03 INSTALLATION**

- A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
  - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
  - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.

### **3.04 CLEANING**

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

### **3.05 PROTECTION**

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

**END OF SECTION**

**SECTION 07 4213.19  
INSULATED METAL WALL PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Factory-assembled metal panel system for walls and soffits with trim, related flashings and accessory components.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 12 00 - Structural Steel Framing: Structural steel building frame.
- B. Section 05 40 00 - Cold-Formed Metal Framing: Stud wall framing system.
- C. Section 07 1400: Waterproof membrane seal at bottom of panels.
- D. Section 07 21 00 - Thermal Insulation.
- E. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.
- F. Section 07 62 00 - Sheet Metal Flashing and Trim.
- G. Section 07 6200: Metal cap flashings over panels.

**1.03 REFERENCE STANDARDS**

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- E. ASTM E413 - Classification for Rating Sound Insulation; 2016.

**1.04 PRE-INSTALLATION MEETING**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer documentation on tested structural, thermal, and fire resistance capabilities of assembled panel.
- B. Shop Drawings: Indicate dimensions.
- C. Samples: Submit two samples of panel, 12\_by 12 inch in size illustrating finish color, sheen, and texture.
- D. Manufacturer's Installation Instructions: Indicate special handling criteria, installation sequence, and cleaning procedures.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years experience and approved by manufacturer.

**1.07 MOCK-UP**

- A. Construct mock-up full height by one panel width showing panels, panel attachment to building frame, associated vapor retarder and air seal materials, sealants and seals.
- B. Demonstrate component assembly including panel materials, weep drainage system, attachments, anchors, and perimeter sealant.



- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that could cause discoloration or staining.

#### **1.09 WARRANTY**

- A. Correct defective Work within a five year period after Date of Substantial Completion, including:
  - 1. Degradation of panel finish including color fading caused by exposure to weather.
  - 2. Failure of water tightness, loss of integrity of seals.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of Design:
  - 1. Kingspan, Mini Micro Rib Panel.
  - 2. Kingspan KS Granitstone
  - 3. Kingspan Shadowline
- B. Other Acceptable Manufacturers:
  - 1. Centria: [www.centria.com](http://www.centria.com).
  - 2. Metl-Span, a Division of NCI Group, Inc:
  - 3. MBCI:

#### **2.02 PANEL SYSTEM**

- A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.
  - 1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
  - 2. Accommodate tolerances of building structural framing.
  - 3. Provide continuity of thermal barrier at building enclosure elements.
  - 4. Provide continuity of vapor retarder at building enclosure elements.
  - 5. Provide continuity of air barrier seal at building enclosure elements.
- B. Performance Requirements:
  - 1. Thermal Performance: Provide thermal resistance through entire system; R-value of 8 per inch thickness, minimum at 4 inch panels .
  - 2. Structural Performance: Design and size to withstand all dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.
    - a. Verify structural performance in accordance with ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10 seconds duration of maximum load.
    - b. Design Wind Loads: Calculated in accordance with 2015 IBC code.
    - c. Maximum Allowable Deflection of Panel: 1/90 of span.
  - 3. Acoustical Performance: Provide minimum sound attenuation through system (exterior to interior) of STC 38, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
  - 4. Movement: Accommodate the movement caused by the following without damage to system, components, or deterioration of seals:
    - a. Normal movement between system components.
    - b. Seasonal temperature cycling.
    - c. Deflection of structural support framing,

### 2.03 PANELS AND TRIM

- A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place insulation; exterior and interior sheet interlocking at edges, fitted with continuous gaskets.
  - 1. Panel Width: As indicated inch.
  - 2. Profile: As indicated on drawings; vertical panels.
  - 3. Panel Thickness: 4 inches.
  - 4. Exterior Sheet: Pre-finished galvanized steel, 24 gage, 0.0299 inch minimum base metal thickness.
  - 5. Interior Sheet: Galvanized steel, pre-finished, 22 gage, 0.0299 inch minimum base metal thickness.
  - 6. Panel Edge Profile: Tongue and groove, for flush seam.
  - 7. Fabricate panels in longest practicable lengths.
  - 8. Exterior Finish: Polyvinylidene fluoride (PVDF) coating; color as selected from manufacturer's standard range.
  - 9. Interior Finish: Polyvinylidene fluoride (PVDF) coating; color as selected from manufacturer's standard range.

### 2.04 PANEL MATERIALS

- A. Precoated Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Commercial Steel (CS) or Forming Steel (FS), with AZ55/AZM165 coating; continuous coil coated with acrylic primer coat, polyvinylidene fluoride (PVDF) top coat, and polyester washcoat for panel back.
  - 1. Color of Exposed Exterior Surfaces: As selected by Architect from manufacturer's standard range.
- B. Foamed-in-Place Insulation: Urethane type.
- C. Gaskets: Manufacturer's standard type suitable for use with panel system, permanently resilient; ultraviolet and ozone resistant.
- D. Panel Sealants: Manufacturer's standard type suitable for use with installation of panel system; non-staining, skinning, non-shrinking, non-sagging, ultra-violet and ozone resistant.

### 2.05 ACCESSORIES

- A. Concealed Sealants: Non-curing butyl sealant or tape sealant.
- B. Exposed Sealants: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
  - 1. Products:
    - a. Franklin International, Inc; Titebond WeatherMaster Metal Roof Sealant: [www.titebond.com/#sle](http://www.titebond.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Subgirts: Steel, thickness indicated on drawings. inch thick, profile as indicated to attach panel system to building.
- D. Anchors: Galvanized steel.
- E. Fasteners: Manufacturer's standard type to suit application; hot-dip galvanized steel with soft neoprene washers. Fastener cap same color as exterior panel.
- F. Field Touch-up Paint: As recommended by panel manufacturer.
- G. Bituminous Paint: Asphalt base.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install panel system on walls in accordance with manufacturer's instructions.
- B. Protect panel surfaces in contact with cementitious materials with bituminous paint. Allow to dry prior to installation.

- C. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.
- D. Locate panel joints over supports.
- E. Provide expansion joints where indicated.
- F. Use concealed fasteners unless otherwise approved by Architect.
- G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

### **3.02 TOLERANCES**

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

### **3.03 CLEANING**

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

**END OF SECTION**

**SECTION 07 6200  
SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Sealants for joints within sheet metal fabrications.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 7100 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.
- B. Section 07 7200 - Roof Accessories: Manufactured metal roof curbs.
- C. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

**1.03 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- C. ASTM B32 - Standard Specification for Solder Metal 2020.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

**1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Sheet Metal Flashing and Trim Manufacturers:
  - 1. Fairview Architectural LLC:
  - 2. Petersen Aluminum Corporation:
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 SHEET MATERIALS**

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
  - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
  - 2. Color: As selected by Architect from manufacturer's standard colors.

- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gage, (0.0156 inch) thick; smooth No. 4 - Brushed finish.

### **2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing sheets. Return and brake edges.
- G. Fabricate snow guards if specified..

### **2.04 ACCESSORIES**

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).
- C. Slip Sheet: Rosin sized building paper.
- D. Primer: Zinc chromate type.
- E. Concealed Sealants: Non-curing butyl sealant.
- F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- G. Plastic Cement: ASTM D4586/D4586M, Type I.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

### **3.02 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

### **3.03 INSTALLATION**

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Secure gutters and downspouts in place with concealed fasteners.
- F. Slope gutters 1/4 inch per 10 feet, minimum.
- G. Connect downspouts to downspout boots, and grout connection watertight.
- H. Set splash pads under downspouts.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

**END OF SECTION**

## **SECTION 07 7100 ROOF SPECIALTIES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Manufactured roof specialties, including copings and fascias.

#### **1.02 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems 2017.
- C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).
- D. NRCA (RM) - The NRCA Roofing Manual 2022.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

#### **1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of coping.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Roof Edge Flashings and Copings:
  - 1. Architectural Products Co:
  - 2. ATAS International, Inc:
  - 3. OMG Roofing Products:
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Counterflashings:
  - 1. ATAS International, Inc: [www.atas.com/#sle](http://www.atas.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 COMPONENTS**

- A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
  - 1. Configuration: Fascia, cant, and edge securement for roof membrane.
  - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
  - 3. Material: Formed steel sheet, galvanized, 24 gage, 0.024 inch thick, minimum.
  - 4. Finish: 70 percent polyvinylidene fluoride.
  - 5. Color: To be selected by Architect from manufacturer's standard range.
  - 6. Manufacturers:
    - a. OMG Roofing Products:
    - b. ATAS
    - c. GAF
    - d. Substitutions: See Section 01 6000 - Product Requirements.

- B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
  - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
  - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
  - 3. Material: Formed steel sheet, galvanized, 24 gage, 0.024 inch thick, minimum.
  - 4. Finish: 70 percent polyvinylidene fluoride.
  - 5. Color: To be selected by Architect from manufacturer's standard range.
  - 6. Manufacturers:
    - a. OMG Roofing Products:
    - b. ATAS.
    - c. GAF.
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with sheet metal roof systems, and capable of accommodating pipes sized between 3/8 inch and 12 inch.

## **2.03 FINISHES**

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

## **2.04 ACCESSORIES**

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
- C. Roof Cement: ASTM D4586/D4586M, Type I.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

## **3.02 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

**END OF SECTION**



**SECTION 07 7123  
MANUFACTURED GUTTERS AND DOWNSPOUTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pre-finished galvanized steel gutters and downspouts.
- B. Precast concrete splash pads.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Downspout boots.
- B. Section 07 6200 - Sheet Metal Flashing and Trim.
- C. Section 09 9113 - Exterior Painting: Field painting of metal surfaces.

**1.03 REFERENCE STANDARDS**

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Comply with applicable code for size and method of rain water discharge.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Scuppers, Collectors and Downspouts:
  - 1. ATAS International, Inc; Water Control System:
  - 2. Drexel Metals Inc.
  - 3. SAF Perimeter Systems:
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 MATERIALS**

- A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
  - 1. Finish: Shop pre-coated with modified silicone coating.
  - 2. Color: As selected from manufacturer's standard colors.
- B. Protective Backing Paint: Zinc molybdate alkyd.

### **2.03 COMPONENTS**

- A. Downspouts, Scuppers and Collectors: As detailed on drawings.
- B. Anchors and Supports: Profiled to suit gutters and downspouts.
  - 1. Anchoring Devices: In accordance with CDA requirements.
  - 2. Downspout Supports: Brackets.
- C. Fasteners: Same material and finish as gutters and downspouts , with soft neoprene washers.

### **2.04 ACCESSORIES**

- A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
- B. Downspout Boots: Cast iron; ASTM A48.

### **2.05 FABRICATION**

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate scupper and downspout accessories; seal watertight.

### **2.06 FINISHES**

- A. Modified silicone polyester coating: Baked enamel system complying with AAMA 2603.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

### **3.02 INSTALLATION**

- A. Install scuppers, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal scuppers to downspouts and accessories.
- C. Slope gutters 1/4 inch per foot.

**END OF SECTION**

## **SECTION 07 9200 JOINT SEALANTS**

### **<<<<<<< UPDATE NOTES**

#### **PART 1 GENERAL**

##### **2.01 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

##### **2.02 RELATED REQUIREMENTS**

- A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
- B. Section 07 9513 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.
- C. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.
- D. Section 08 8000 - Glazing: Glazing sealants and accessories.
- E. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- F. Section 09 2216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.
- G. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

##### **2.03 REFERENCE STANDARDS**

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants 2018 (Reapproved 2022).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2022.
- F. SCAQMD 1168 - Adhesive and Sealant Applications 1989, with Amendment (2022).

##### **2.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Certification by manufacturer indicating that product complies with specification requirements.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

##### **2.05 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. ----- Following is related to FIELD QUALITY CONTROL, coordinate with Owner/Architect-----

## **2.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 PRODUCTS**

### **3.01 MANUFACTURERS**

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
  - 1. Bostik Inc:
  - 2. Dow Chemical Company:
  - 3. Hilti, Inc:
  - 4. Pecora Corporation:
  - 5. Sika Corporation; [ ]: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
  - 6. Tremco Commercial Sealants & Waterproofing; [ ]: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - 7. W.R. Meadows, Inc:
  - 8. Substitutions: See Section 01 6000 - Product Requirements.

### **3.02 JOINT SEALANT APPLICATIONS**

- A. ---- EDIT SCOPE CAREFULLY -- Exclude items not applicable, and add others ----
- B. Scope:
  - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
    - a. Wall expansion and control joints.
    - b. Joints between door, window, and other frames and adjacent construction.
    - c. Joints between different exposed materials.
    - d. Openings below ledge angles in masonry.
    - e. Other joints indicated below.
  - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
    - a. Joints between door, window, and other frames and adjacent construction.
    - b. Other joints indicated below.
  - 3. Do not seal the following types of joints.
    - a. Intentional weepholes in masonry.
    - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
    - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
    - d. Joints where installation of sealant is specified in another section.
    - e. Joints between suspended panel ceilings/grid and walls.
- C. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
- D. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
  - 1. Type [ ] - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
- E. Interior Wet Areas: Bathrooms, restrooms, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, other similar items, and [ ].

### 3.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

### 3.04 NONSAG JOINT SEALANTS

- A. ----- Newer Silicones Better Suited For Exterior Use Than Earlier Formulations -----
- B. Type [ ] - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
  2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
  3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
  4. Color: To be selected by Architect from manufacturer's standard range.
  5. Cure Type: Single-component, neutral moisture curing.
  6. Manufacturers:
    - a. Dow Chemical Company; 756 SMS Building Sealant: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
    - b. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - c. Sika Corporation; Sikasil WS-290: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
- C. ----- Conventional Silicone Sealant, Parking Structure and Highway -----
- D. ----- Conventional Silicone Sealant -----
- E. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
  2. Color: To be selected by Architect from manufacturer's standard range.
  3. Cure Type: Single-component, neutral moisture curing
  4. Service Temperature Range: Minus 65 to 180 degrees F.
  5. Manufacturers:
    - a. Dow Chemical Company; 758 Silicone Weather Barrier Sealant: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
    - b. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - c. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - d. Sika Corporation; Sikasil GP: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - e. Substitutions: See Section 01 6000 - Product Requirements.
- F. ----- White or Clear Mildew-Resistant -- Often Referred to as Tub & Tile or Kitchen & Bath ---
- G. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Manufacturers:
    - a. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - b. Sika Corporation; Sikasil GP: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- H. ----- Interior and Exterior Weather Sealing Applications -----
- I. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
1. Color: White.
  2. Manufacturers:
    - a. DAP Products Inc; DYNAFLEX 800 Sealant: [www.dapspecline.com/#sle](http://www.dapspecline.com/#sle).

- b. Substitutions: See Section 01 6000 - Product Requirements.
- J. ----- Newer "Hybrid" Sealants with Reported Longevity of Silicone but Lower Cost -----
- K. ----- Newer "Hybrid" Sealants with Reported Longevity of Silicone but Lower Cost -----
- L. ----- Conventional Polyurethane, Not for Continuous Immersion, Not Tamper-Resistant -----
- M. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  - 1. Movement Capability: Plus and minus 25 percent, minimum.
  - 2. Color: To be selected by Architect from manufacturer's standard range.
  - 3. Service Temperature Range: Minus 40 to 180 degrees F.
  - 4. Manufacturers:
    - a. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - b. The QUIKRETE Companies; QUIKRETE® Polyurethane Non-Sag Sealant: [www.quikrete.com/#sle](http://www.quikrete.com/#sle).
    - c. Sherwin-Williams Company; Stampede 2NS Polyurethane Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - d. Sika Corporation; Sikaflex-1a: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - e. Tremco Commercial Sealants & Waterproofing; Dymonic 100: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
    - f. W. R. Meadows, Inc; POURTHANE NS: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - g. Substitutions: See Section 01 6000 - Product Requirements.
- N. ----- Polyurethane Suitable for Continuous Immersion in Potable Water (not chemicals) -----
- O. ----- Nonsag Traffic-Grade Polyurethane -----
- P. ----- Polyurethane That's Harder Than Normal, to Resist "Picking Out" -----
- Q. ----- Epoxy Sealant is Not as Flexible as Others, Use It Where Its Hardness is Desirable -----
- R. ----- Polysulfides Have Only Medium Movement, Used Primarily for Chemical Resistance -----
- S. ----- Polysulfide is One of Few Suitable for Continuous Water Immersion -----
- T. ----- Newer "Hybrid" Sealant, Much Greater Movement Than Plain Latex -----
- U. ----- Conventional Acrylic Latex, Interior Non-Wet Areas Only, No to Low Movement -----
- V. ----- Solvent Based -- Significant VOCs -----
- W. ----- The Only Available Non-Curing Type -- SOLVENT BASED -----

### 3.05 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  - 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
  - 2. Open Cell: 40 to 50 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

## PART 3 EXECUTION

### 4.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

- C. Verify that backer rods are of the correct size.

#### **4.02 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

**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. Thermally insulated hollow metal doors with frames.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 7100 - Door Hardware.
- B. Section 09 9113 - Exterior Painting: Field painting.
- C. Section 09 9123 - Interior Painting: Field painting.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames 2019.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.
- D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- G. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
- H. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames 2012.
- I. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- J. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- K. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
- L. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

**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. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

**1.05 QUALITY ASSURANCE**

**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. Ceco Door, an Assa Abloy Group company:
  - 2. Curries, an Assa Abloy Group company:
  - 3. Republic Doors.
  - 4. Steelcraft.
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 DESIGN CRITERIA**

- A. 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.

### **2.03 HOLLOW METAL DOORS**

- A. Door Finish: Factory finished.
- B. Exterior Doors: Thermally insulated.
  - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 3 - Extra Heavy-duty.
    - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
    - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
  - 2. Door Core Material: Polyisocyanurate 2 lbs/cu ft minimum density.
    - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
  - 3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
  - 4. Door Thickness: 1-3/4 inch, nominal.
  - 5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
  - 6. Door Face Sheets: Flush.
  - 7. Weatherstripping: Refer to Section 08 7100.
- C. Interior Doors, Non-Fire Rated:
  - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  - 3. Door Thickness: 1-3/4 inch, nominal.
  - 4. Door Face Sheets: Flush.

### **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory finished.

- C. Exterior Door Frames: Full profile/continuously welded type.
  - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 2. Weatherstripping: Separate, see Section 08 7100.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

## **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
  - 1. Color: As selected by Architect from manufacturer's standard range.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## **2.06 ACCESSORIES**

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
  - 1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
- B. Glazing: As specified in Section 08 8000, factory installed.

## **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.

### **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. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Install door hardware as specified in Section 08 7100.
- E. Comply with glazing installation requirements of Section 08 8000.
- F. Touch up damaged factory finishes.

**END OF SECTION**

**SECTION 08 3100  
ACCESS DOORS AND PANELS**

**<<<<<< UPDATE NOTES**

**PART 1 GENERAL**

**2.01 SECTION INCLUDES**

- A. Wall and ceiling access door and frame units.

**2.02 RELATED REQUIREMENTS**

- A. Section 09 9113 - Exterior Painting: Field paint finish.
- B. Section 09 9123 - Interior Painting: Field paint finish.

**2.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

**2.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

**PART 2 PRODUCTS**

**3.01 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Wall-Mounted Units:
  - 1. Location: As indicated on drawings.
  - 2. Size: 18 inch by 18 inch or as shown on contract drawings.
  - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
  - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
  - 5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
  - 1. Size: 18 inch by 18 inch.
  - 2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
  - 3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
  - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- C. Ceiling-Mounted Units:
  - 1. Location: As indicated on drawings.
  - 2. Material: Steel.
  - 3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
  - 4. Size - Other Ceilings: 18 inch by 18 inch or as shown on contract drawings.
  - 5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

**3.02 WALL AND CEILING MOUNTED UNITS**

- A. Manufacturers:
  - 1. Babcock-Davis:
  - 2. Milcor, Inc; [ ]:
  - 3. Nystrom, Inc:
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

### **PART 3 EXECUTION**

#### **4.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **4.02 PREPARATION**

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

#### **4.03 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

**END OF SECTION**

**SECTION 08 3313  
COILING COUNTER DOORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated coiling counter doors and operating hardware.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Rough openings.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 09 2116 - Gypsum Board Assemblies: Rough openings.
- D. Section 09 9113 - Exterior Painting: Field paint finish.
- E. Section 09 9123 - Interior Painting: Field paint finish.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Coiling Counter Doors:
  - 1. C.H.I. Overhead Doors; Model 6522 (steel):
  - 2. Cookson
  - 3. Raynor
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 COILING COUNTER DOORS**

- A. Coiling Counter Doors, Non-Fire-Rated: Galvanized steel slat curtain.
  - 1. Mounting: As indicated on drawings.
  - 2. Nominal Slat Size: 1-1/4 inches wide.
  - 3. Slat Profile: Flat.
  - 4. Finish, Galvanized Steel: Factory baked enamel.
  - 5. Color: As selected by Architect from manufacturer's standard range.
  - 6. Guides: Formed track; same material and finish unless otherwise indicated.
  - 7. Hood Enclosure: Manufacturer's standard; galvanized steel to match curtain.
  - 8. Manual push up operation.
  - 9. Locking Devices: inside.

**2.03 MATERIALS**

- A. Curtain Construction: Interlocking, single thickness slats.
  - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.

2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
  3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 16 gage, 0.06 inch.
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
  - C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
  - D. Lock Hardware:
    1. Latching Mechanism: Manufacturer's standard. Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
    2. Latch Handle: Manufacturer's standard.
    3. Manual Chain Lift: Provide padlockable chain keeper on guide.
  - E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that opening sizes, tolerances and conditions are acceptable.

### **3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- D. Install perimeter trim as indicated.

### **3.03 ADJUSTING**

- A. Adjust operating assemblies for smooth and noiseless operation.

### **3.04 CLEANING**

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**

**SECTION 08 5113  
ALUMINUM WINDOWS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Extruded aluminum windows with fixed sash.
- B. Factory glazing.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Steel lintels.
- B. Section 06 1000 - Rough Carpentry: Rough opening framing.
- C. Section 07 2500 - Weather Barriers: Sealing frame to weather barrier installed on adjacent construction.
- D. Section 07 9200 - Joint Sealants: Sealing joints between window frames and adjacent construction.
- E. Section 08 8000 - Glazing.

**1.03 REFERENCE STANDARDS**

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- D. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.
- F. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights 2019c.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions and information on glass and glazing.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Manufacturer's Qualification Statement.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with requirements of AAMA CW-10.

**1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Aluminum Windows:
  - 1. EFCO, a Pella Company:
  - 2. Manko Window Systems, Inc:
  - 3. CR Laurence..

### **2.02 WINDOWS**

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
  - 1. Frame Depth: 2-1/2 inches.
  - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
  - 3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
  - 4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
  - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- B. Fixed, Non-Operable Type:
  - 1. Construction: Thermally broken.
  - 2. Glazing: Insulated Double; clear; transparent.
  - 3. Exterior Finish: Class I color anodized.
  - 4. Interior Finish: Class I color anodized.

### **2.03 COMPONENTS**

- A. Frames: 2 1/2 inch wide by 2 1/2 inch deep profile, flush glass stops of snap-on type.
- B. Glazing: As specified in Section 08 8000.
- C. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

### **2.04 FINISHES**

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
- B. Finish Color: As selected by Architect from manufacturer's standard range.
- C. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

### **3.02 INSTALLATION**

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.



D. Install glass in accordance with requirements specified in Section 08 8000.

### **3.03 TOLERANCES**

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

### **3.05 ADJUSTING**

A. Adjust hardware for smooth operation and secure weathertight closure.

### **3.06 CLEANING**

- A. Remove protective material from factory finished aluminum surfaces.
- B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

**END OF SECTION**

**SECTION 08 5659**  
**SERVICE AND TELLER WINDOW UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Service and teller window units.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

**1.03 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.
- C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.
- B. Store units in area protected from exposure to weather and vandalism.

**1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within five years from Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Ticket Window Units:
  - 1. Covenant SE Products, Inc..
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 TELLER WINDOW UNITS**

- A. Location: Built within exterior wall, as indicated on drawings.
- B. Type of Use: Walk-up.
- C. Window Type: Ticket transaction. Vertical lift up.
  - 1. Window Size: 24 inch wide by 48 inch high.
  - 2. Size of Counter Space: Manufacturer's standard size.
  - 3. Material: Aluminum.
    - a. Finish: Color anodized, dark bronze.
  - 4. Header: Manufacturer's standard type.
  - 5. Sill: Manufacturer's standard type.
- D. Glazing: Insulating glass, 1 inch overall depth, clear.
  - 1. Tempered safety glazing.

- E. Communication: Standard talk-through portal.
- F. Products:
  - 1. T2 30 x 36 with 12" x 4" vertical lift window..
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

## **2.03 ASSEMBLY COMPONENTS**

- A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
  - 1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
  - 2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
  - 3. Apply factory finish to exposed surfaces.
  - 4. Wind Design: Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

## **2.04 FINISHES**

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

## **2.05 ACCESSORIES**

- A. Speak-Through Portal: Heavy duty, non-electric, stainless steel unit.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that window openings are ready for installation of windows.
- B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install units in correct orientation (inside/outside or secure/non-secure).
- C. Anchor units securely in manner so as to achieve performance specified.

### **3.03 ADJUSTING**

- A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

### **3.04 CLEANING**

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

### **3.05 PROTECTION**

- A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

**END OF SECTION**

## **SECTION 08 7100 DOOR HARDWARE**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Hardware for hollow metal doors.
- B. Lock cylinders for doors that hardware is specified in other sections.
- C. Door Hardware Schedule will be issued by addendum at a later date.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealants for setting exterior door thresholds.
- B. Section 08 1113 - Hollow Metal Doors and Frames.
- C. Section 08 1116 - Aluminum Doors and Frames.
- D. Section 08 3323 - Overhead Coiling Doors: Door hardware, except cylinders.
- E. Section 08 4313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
- F. Section 10 2600 - Wall and Door Protection: Door and frame protection.
- G. Section 28 1000 - Access Control: Electronic access control devices.
- H. Section 28 4600 - Fire Detection and Alarm: Electrical connection to activate door closers.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. BHMA (CPD) - Certified Products Directory Current Edition.
- C. BHMA A156.1 - Standard for Butts and Hinges 2021.
- D. BHMA A156.2 - Bored and Preamsembled Locks and Latches 2017.
- E. BHMA A156.3 - Exit Devices 2020.
- F. BHMA A156.4 - Door Controls - Closers 2019.
- G. BHMA A156.6 - Standard for Architectural Door Trim 2021.
- H. BHMA A156.7 - Template Hinge Dimensions 2016.
- I. BHMA A156.12 - Interconnected Locks 2018.
- J. BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
- K. BHMA A156.18 - Materials and Finishes 2020.
- L. BHMA A156.21 - Thresholds 2019.
- M. BHMA A156.22 - Standard for Gasketing 2021.
- N. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- P. ITS (DIR) - Directory of Listed Products Current Edition.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- R. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- T. UL (DIR) - Online Certifications Directory Current Edition.
- U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
  - 1. Architect.
  - 2. Hardware Installer.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
  - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
  - 2. Provide complete description for each door listed.
  - 3. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
  - 4. Include account of abbreviations and symbols used in schedule.
- D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
  - 1. Submit manufacturer's parts lists and templates.
  - 2. Bitting List: List of combinations as furnished.
- E. Keying Schedule:
  - 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- F. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

#### **1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
  - 1. Closers: Five years, minimum.
  - 2. Exit Devices: Three years, minimum.
  - 3. Locksets and Cylinders: Three years, minimum.
  - 4. Other Hardware: Two years, minimum.

### **PART 2 PRODUCTS**

#### **2.01 DESIGN AND PERFORMANCE CRITERIA**

- A. Provide specified door hardware as required to make doors fully functional, compliant with Tulsa Public Schools Standards, all applicable codes, and secure to extent indicated.

- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. Accessibility: ADA Standards and ICC A117.1.
  - 3. Applicable provisions of NFPA 101.
  - 4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
  - 5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
- D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule.
- E. Fasteners:
  - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
    - a. Aluminum fasteners are not permitted.
    - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
  - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
    - a. Self-drilling (Tek) type screws are not permitted.
  - 3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
  - 4. Provide wall grip inserts for hollow wall construction.
  - 5. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
  - 6. Fire-Rated Applications: Comply with NFPA 80.
    - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
    - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

## **2.02 FINISHES**

- A. Finishes: Identified in Door Hardware Schedule.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

### **3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Use templates provided by hardware item manufacturer.
- D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

### **3.03 ADJUSTING**

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

### 3.04 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.

### 3.05 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

### 3.06 DOOR HARDWARE SCHEDULE:

#### A. Hardware Set No. 1

- 1. For use on Door: **105**
- 2. Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 each	HINGE	5BB1 4.5 X 4.5	652	IVE
1 each	STOREROOM LOCK	ML2057 NSN - KEY AS REQ - MATCH EXISTING	626	C-R
1 each	SURFACE CLOSER	4040XP SCUSH TBSRT MOUNT TO SUIT CONDITIONS	689	LCN
1 each	KICK PLATE	8400 10"X2" LDW B-CS	BK	ZER
1 each	GASKETING	188S	BK	ZER
1 each	DOOR SWEEP	39A	A	ZER
1 each	THRESHOLD	65A-223	A	ZERO

#### B. Hardware Set No. 2

- 1. For use on Door #(s): **101, 102**
- 2. Provide each SGL doors with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 each	HINGE	5BB1 4.5 X 4.5	652	IVE
1 each	CLASSROOM LOCK	ML2055 NSN - KEY AS REQ - MATCH EXISTING	626	C-R
1 each	SURFACE CLOSER	4040XP REG OR PA AS REQ TBSRT - MOUNT TO SUIT CONDITIONS	689	LCN
1 each	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 each	WALL STOP	WS406/407CVX	630	IVE

1 each	GASKETING	188S (USE SILENCERS AT NON RATED DOORS)	BK	ZER
1 each	DOOR SWEEP	39A	A	ZERO
1 each	THRESHOLD	65A-223	A	ZERO

**C. Hardware Set No.3**

- For use on Doors: **104, 106**
- Provide each SGL door with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1 each	CONT. HINGE	224HD	628	IVE
1 each	CLASSROOM DEADBOLT	DL2217 W/ CYLINDER KEYED AS REQ - MATCH EXISTING	626	C-R
1 each	PUSH PLATE	8200 4" X 16"	630	IVE
1 each	PULL PLATE	8302 10" 4" X 16"	630	IVE
1 each	SURFACE CLOSER	4040XP REG OR PA AS REQ TBSRT - MOUNT TO SUIT CONDITIONS	689	LCN
1 each	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1 each	WALL STOP	WS406/407CVX	630	IVE
1 each	GASKETING	188S (USE SILENCERS AT NON RATED DOORS)	BK	ZER
1 each	DOOR SWEEP	39A	A	ZER
1 each	THRESHOLD	65A-223	A	ZER

**D. Hardware Set No. 4**

- For use on door **103**
- Provide each SGL with the following:

3 each	Hinges	5BB1 4.5 X 4.5	652	IVE
1 Each	STOREROOM LOCK	ML2057 NSN - KEY AS REQ - MATCH EXISTING	626	C-R
1 each	SURFACE CLOSER	4040XP SCUSH TBSRT MOUNT TO SUIT CONDITIONS	689	LCN



1 each	KICKPLATE	8400 10" X 2" LDW B-CS	630	IVE
1 each	WALL STOP	WS406/407CVX	630	IVE

**END OF SECTION**

**SECTION 08 8300  
MIRRORS**

**<<<<#8203UPDATE NOTES**

**PART 1 GENERAL**

**2.01 SECTION INCLUDES**

- A. Glass mirrors.
- B. Polycarbonate mirrors.

**2.02 RELATED REQUIREMENTS**

- A. Section 10 2800 - Toilet Accessories: Metal mirror frames and as shown on Specialties Schedule in Contract drawings.

**2.03 REFERENCE STANDARDS**

- A. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- B. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors) 2011.

**2.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.

**2.05 QUALITY ASSURANCE**

- A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS).

**2.06 FIELD CONDITIONS**

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

**2.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**3.01 MANUFACTURERS**

- A. Mirrors:
  - 1. Bradley 780 Series as shown on contract drawings.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**3.02 MATERIALS**

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

**3.03 ACCESSORIES**

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.
- C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

- D. Glazing Clips: Manufacturer's standard type.
- E. Mirror Attachment Accessories: Stainless steel clips.
- F. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
  - 1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.
- G. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep with 90 degree mitered corners.

### **PART 3 EXECUTION**

#### **4.01 EXAMINATION**

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

#### **4.02 PREPARATION**

- A. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

#### **4.03 INSTALLATION**

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

#### **4.04 CLEANING**

- A. Remove labels after work is complete.
- B. Clean mirrors and adjacent surfaces.

**END OF SECTION**

**SECTION 09 2116  
GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Cementitious backing board.
- G. Gypsum wallboard.
- H. Joint treatment and accessories.
- I. Water-resistive barrier over exterior wall sheathing.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- D. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- E. Section 07 9200 - Joint Sealants:
- F. Section 09 2216 - Non-Structural Metal Framing.

**1.03 REFERENCE STANDARDS**

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members 2012.
- B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 2019.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.
- K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.
- L. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

- M. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
- N. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.
- O. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units 2022.
- P. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- Q. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels 2019.
- R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- S. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- T. ASTM E413 - Classification for Rating Sound Insulation 2022.
- U. GA-216 - Application and Finishing of Gypsum Panel Products 2021.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate special details. associated with fireproofing and acoustic seals.
- C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- D. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

### **PART 2 PRODUCTS**

#### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
  - 1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
  - 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

#### **2.02 METAL FRAMING MATERIALS**

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
  - 1. Clarkwestern Dietrich Building Systems LLC:
  - 2. Marino:
  - 3. SCAFCO Corporation:
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
  - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Ceiling Channels: C-shaped.
  - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Exterior Non-Loadbearing Studsand Furring for Application of Gypsum Board: As specified in Section 09 2216.
- D. Loadbearing Studs for Application of Gypsum Board: As specified in Section 05 4000.

- E. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
- F. Area Separation Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with specified performance requirements.
- G. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- H. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

## 2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
  - 1. American Gypsum Company
  - 2. CertainTeed Corporation:
  - 3. Georgia-Pacific Gypsum:
  - 4. National Gypsum Company:
  - 5. USG Corporation:
  - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  - 4. Thickness:
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 1/2 inch.
- C. Abuse Resistant Wallboard:
  - 1. Application: High-traffic areas indicated on contract drawings.
  - 2. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
  - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 4. Type: Fire resistance rated Type X, UL or WH listed.
  - 5. Thickness: 5/8 inch.
  - 6. Edges: Tapered.
- D. Backing Board For Wet Areas:
  - 1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and [\_\_\_\_\_].
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    - a. Thickness: 5/8 inch.
    - b. Products:
      - 1) National Gypsum Company; PermaBase Cement Board:
      - 2) USG Corporation:
      - 3) Substitutions: See Section 01 6000 - Product Requirements.
- E. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
  - 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 3. Type: Regular and Type X, in locations indicated.
  - 4. Type X Thickness: 5/8 inch.

5. Regular Board Thickness: 5/8 inch.
6. Edges: Tapered.
7. Products:
  - a. American Gypsum Company; M-Bloc.
  - b. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board.
  - c. Georgia-Pacific Gypsum; DensArmor Plus.
  - d. National Gypsum Company; Gold Bond XP Gypsum Board.
  - e. Substitutions: See Section 01 6000 - Product Requirements.
- F. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Ceilings, unless otherwise indicated.
  2. Thickness: 1/2 inch.
  3. Edges: Tapered.
- G. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
  1. Application: Exterior sheathing, and roof recovery board unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
  4. Paper-Faced Sheathing: Gypsum sheathing board as defined in ASTM C1396/C1396M, moisture resistant type with water repellent paper faces.
  5. Core Type: Regular.
  6. Regular Board Thickness: 5/8 inch.
  7. Edges: Square.
  8. Glass Mat Faced Products:
    - a. American Gypsum Company; M-Glass Exterior Sheathing Type X.
    - b. Georgia-Pacific Gypsum; DensGlass Sheathing.
    - c. National Gypsum Company; Gold Bond eXP Sheathing.
- H. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
  2. Type X Thickness: 5/8 inch.
  3. Regular Type Thickness: 1/2 inch.
  4. Edges: Tapered.
  5. Products:
    - a. American Gypsum Company; Exterior Soffit Gypsum Wallboard Type C.
    - b. Georgia-Pacific Gypsum; ToughRock Fireguard C Soffit Board.
    - c. Substitutions: See Section 01 6000 - Product Requirements.

## 2.04 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: As specified in Section 07 2500.
- D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
  1. Types: As detailed or required for finished appearance.
  2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
  3. Products:
    - a. Same manufacturer as framing materials.
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

### **3.02 SHAFT WALL INSTALLATION**

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
  - 1. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

### **3.03 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
  - 1. Laterally brace entire suspension system.
  - 2. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
  - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
  - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  - 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Blocking: Install wood blocking for support of:
  - 1. Framed openings.
  - 2. Wall mounted cabinets.
  - 3. Plumbing fixtures.
  - 4. Toilet partitions.
  - 5. Toilet accessories.
  - 6. Wall mounted door hardware.

### **3.04 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

### **3.05 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
  - 1. Seal joints, cut edges, and holes with water-resistant sealant.
  - 2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.



- C. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
  - 1. Seal joints, cut edges, and holes with water resistant sealant.
- D. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

### **3.06 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
  - 1. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

### **3.07 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 3. Level 3: Walls to receive textured wall finish.
  - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling and sanding is not required at base layer of double layer applications.
- C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

### **END OF SECTION**

**SECTION 09 2216  
NON-STRUCTURAL METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 4000 - Cold-Formed Metal Framing: Structural load bearing metal stud framing and Exterior wall stud framing.
- B. Section 05 4000 - Cold-Formed Metal Framing: Execution requirements for anchors for attaching work of this section.
- C. Section 05 5000 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.
- D. Section 06 1000 - Rough Carpentry: Wood blocking within stud framing.
- E. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- F. Section 07 2500 - Weather Barriers.
- G. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings
- H. Section 08 5113 - Aluminum Windows: Product requirements for window anchors.
- I. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

**1.03 REFERENCE STANDARDS**

- A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
  - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

**1.05 MOCK-UP**

- A. Provide mock-up of stud wall, ceiling, and soffit framing including insulation, sheathing, window frame, and door frame and finish specified in other sections. Coordinate with installation of associated work specified in other sections.
  - 1. Mock-up Size: Full height, minimum 12 feet long, including corner.
  - 2. Mock-up may remain as part of the Work.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
  - 1. ClarkDietrich Building Systems:
  - 2. Marino:
  - 3. SCAFCO Corporation:
  - 4. Steel Construction Systems:

5. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 FRAMING MATERIALS**

- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of  $L/240$  at 5 psf.
  - 1. Studs: C shaped with flat or formed webs with knurled faces.
  - 2. Runners: U shaped, sized to match studs.
- B. Loadbearing Studs: As specified in Section 05 4000.
- C. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.
- D. Acoustic Insulation: As specified in Section 07 2100.

## **2.03 FABRICATION**

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.

### **3.02 INSTALLATION OF STUD FRAMING**

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.
- E. Align and secure top and bottom runners at 24 inches on center.
- F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks using crimping method. Do not weld.
- I. Fabricate corners using a minimum of three studs.
- J. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- K. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- L. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

### **3.03 CEILING AND SOFFIT FRAMING**

- A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- B. Install furring independent of walls, columns, and above-ceiling work.
- C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

- E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

#### **3.04 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

**END OF SECTION**

**SECTION 09 5100  
ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.
- B. Section 08 3100 - Access Doors and Panels: Access panels.
- C. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

**1.03 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2022.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS: REFER TO FINISH SCHEDULE IN CONTRACT DRAWINGS FOR SPECIFIC PRODUCTS.**

**2.02 SUSPENSION SYSTEM(S): COMPATIBLE WITH ACOUSTICAL TILE SPECIFIED.**

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

**2.03 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.

- B. Verify that layout of hangers will not interfere with other work.

### **3.02 PREPARATION**

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

### **3.03 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Use longest practical lengths.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

### **3.04 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
  - 1. Make field cut edges of same profile as factory edges.

**END OF SECTION**

**SECTION 09 9113  
EXTERIOR PAINTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Exposed surfaces of steel lintels and ledge angles.
  - 3. Mechanical and Electrical:
    - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Non-metallic roofing and flashing.
  - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
  - 7. Floors, unless specifically indicated.
  - 8. Ceramic and other types of tiles.
  - 9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
  - 10. Glass.
  - 11. Concealed pipes, ducts, and conduits.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 09 9123 - Interior Painting.
- C. Section 09 9600 - High-Performance Coatings.

**1.03 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this section.

**1.04 REFERENCE STANDARDS**

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- E. SSPC-SP 2 - Hand Tool Cleaning 2018.
- F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
  - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. 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 Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

#### **1.06 MOCK-UP**

- A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B. Locate where directed by Architect.
- C. Mock-up may remain as part of the work.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.08 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
  - 1. Behr Process Corporation:
  - 2. PPG Paints:
  - 3. Pratt & Lambert Paints:
  - 4. Sherwin-Williams Company:
  - 5. Valspar Corporation:



C. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 PAINTS AND FINISHES - GENERAL**

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  2. Supply each paint material in quantity required to complete entire project's work from a single production run.
  3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.

## **2.03 PAINT SYSTEMS - EXTERIOR**

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete and primed metal.
1. Two top coats and one coat primer.
  2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
    - a. Products:
      - 1) Behr Marquee Exterior Flat [No. 4450]. (MPI #10)
      - 2) Behr Pro e600 Exterior Flat Paint [No.610]. (MPI #10)
      - 3) PPG Paints Speedhide Exterior Latex Flat, 6-610XI Series. (MPI #10)
      - 4) Pratt & Lambert Pro-Hide Gold Exterior Latex, Flat.
      - 5) Valspar Emblem Exterior Latex, No. 56500 Series, Flat.
      - 6) Substitutions: Section 01 6000 - Product Requirements.
  3. Top Coat(s): Exterior Alkyd Enamel; MPI #94 or 96.
    - a. Products:
      - 1) PPG Paints Interior/Exterior Industrial Enamel, Gloss, 7-282. (MPI #96)
      - 2) PPG Paints Fast Dry 35 Quick Drying Enamel, Gloss, 95-9000.
      - 3) Substitutions: Section 01 6000 - Product Requirements.
  4. Primer: As recommended by top coat manufacturer for specific substrate.

## **2.04 PRIMERS**

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer; MPI #3.
    - a. Products:
      - 1) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #3)
      - 2) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #3)
      - 3) PPG Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603 Series. (MPI #3)
      - 4) Pratt & Lambert Pro-Hide Gold Exterior Acrylic Cement and Stucco Primer. (MPI #3)
      - 5) Substitutions: Section 01 6000 - Product Requirements.
  2. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
    - a. Products:
      - 1) PPG Paints Speedhide Interior/Exterior Rust Inhibitive Steel Primer, 6-212 Series. (MPI #79)
      - 2) PPG Devguard Multi-Purpose Primer, 4160 Series. (MPI #79)
      - 3) Pratt & Lambert Alkyd Shopcoat Primer, OTC Compliant. (MPI #79)
      - 4) Valspar Armor Anti-Rust Oil Metal Primer, No. 21852. (MPI #79)
      - 5) Substitutions: Section 01 6000 - Product Requirements.

3. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
  - a. Products:
    - 1) PPG Devguard Multi-Purpose Primer, 4160 Series. (MPI #76)
4. Alkyd Primer for Galvanized Metal.
  - a. Products:
    - 1) PPG Paints Speedhide Interior/Exterior Galvanized Steel Primer, 6-209 Series.
    - 2) Valspar Armor Anti-Rust Oil Galvanized Primer, No. 21850.
5. Rust-Inhibitive Water Based Primer; MPI #107.
  - a. Products:
    - 1) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #107)
    - 2) PPG Paints Pitt-Tech Plus DTM Industrial Primer, 90-912 Series.
6. Stain Blocking Primer; MPI #136.
  - a. Products:
    - 1) PPG Paints Seal Grip Interior/Exterior Alkyd Universal Primer Sealer, 17-941NF Series. (MPI #136)
    - 2) Pratt & Lambert Pro-Hide Gold Exterior Alkyd Stain Blocking Primer. (MPI #136)
    - 3) Substitutions: Section 01 6000 - Product Requirements.
7. Latex Primer for Exterior Wood; MPI #6.
  - a. Products:
    - 1) Kilz Premium Water-Based Primer [No. 1300]. (MPI #6)
    - 2) PPG Paints Seal Grip Acrylic Primer, 17-921 Series. (MPI #6)
    - 3) Pratt & Lambert Pro-Hide Gold Exterior Latex Primer. (MPI #6)
    - 4) Pratt & Lambert Pro-Hide Gold Interior/Exterior Waterborne Primer. (MPI #6)
    - 5) Valspar Latex Exterior Primer, No. 165219. (MPI #6)
    - 6) Substitutions: Section 01 6000 - Product Requirements.

## **2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

- F. Concrete:
- G. Galvanized Surfaces:
  - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  - 2. Prepare surface according to SSPC-SP 2.
- H. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

### **3.03 APPLICATION**

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Sand metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

### **3.05 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### **3.06 PROTECTION**

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

**END OF SECTION**

**SECTION 09 9123  
INTERIOR PAINTING**

**<<<<< UPDATE NOTES**

**PART 1 GENERAL**

**2.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and stains.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Elevator pit ladders.
  - 3. Prime surfaces to receive wall coverings.
  - 4. Mechanical and Electrical:
    - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    - b. In finished areas, paint shop-primed items.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
  - 5. Floors, unless specifically indicated.
  - 6. Glass.
  - 7. Concealed pipes, ducts, and conduits.

**2.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 05 5100 - Metal Stairs: Shop-primed items.
- C. Section 09 9113 - Exterior Painting.
- D. Section 09 9600 - High-Performance Coatings.

**2.03 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this section.

**2.04 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).
- D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- F. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

G. SSPC-SP 6 - Commercial Blast Cleaning 2007.

## **2.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
  - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
  - 4. Manufacturer's installation instructions.
- C. Samples: Submit two paper chip samples, 8x8 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. 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 Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

## **2.06 MOCK-UP**

- A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, four feet long by eight feet high, illustrating paint color, texture, and finish.
- C. Provide door and frame assembly illustrating paint color, texture, and finish.
- D. Locate where directed by Architect.
- E. Mock-up may remain as part of the work.

## **2.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

## **2.08 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## **PART 2 PRODUCTS**

### **3.01 MANUFACTURERS**

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
1. -----
  2. -----
  3. Behr Process Corporation:
  4. Diamond Vogel Paints:
  5. PPG Paints:
  6. Pratt & Lambert Paints:
  7. Sherwin-Williams Company:
  8. Valspar Corporation:
- C. Transparent Finishes:
1. Behr Process Corporation:
  2. PPG Paints Deft Interior Clears/Polyurethanes:
  3. Sherwin-Williams Company:
- D. Stains:
1. Behr Process Corporation:
  2. PPG Paints Deft Interior Stains:
  3. Sherwin-Williams Company:
- E. Primer Sealers: Same manufacturer as top coats.
- F. Substitutions: See Section 01 6000 - Product Requirements.

### **3.02 PAINTS AND FINISHES - GENERAL**

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  2. Supply each paint material in quantity required to complete entire project's work from a single production run.
  3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
  2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

### **3.03 PAINT SYSTEMS - INTERIOR**

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, wood, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.

2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
    - a. Products:
      - 1) PPG Paints Pure Performance Interior Latex, 9-100 Series, Flat. (MPI #143)
      - 2) PPG Paints Speedhide zero Latex, 6-4110XI Series, Flat. (MPI #143)
      - 3) Pratt & Lambert RedSeal Supreme Interior, Flat. (MPI #143)
      - 4) Sherwin-Williams Harmony Interior Acrylic Latex, Flat. (MPI #143)
      - 5) Valspar Professional Interior Latex, No. 11600 Series, Flat.
      - 6) Substitutions: Section 01 6000 - Product Requirements.
  3. Top Coat Sheen:
    - a. Satin: MPI gloss level 4; use this sheen for items subject to frequent touching by occupants, including door frames and railings.
  4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Two top coats and one coat primer.
  2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
    - a. Products:
      - 1) PPG Paints Pitt-Glaze WB Water-Borne Acrylic Epoxy, 16-598 Series, Semi-Gloss.
      - 2) Sherwin-Williams Waterbased Catalyzed Epoxy, Semi-Gloss.
      - 3) Substitutions: Section 01 6000 - Product Requirements.
- C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, concrete, uncoated steel, shop primed steel, galvanized steel, and aluminum.
1. Two top coats and one coat primer.
  2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
    - a. Products:
      - 1) PPG Paints Pitt-Glaze WB Water-Borne Acrylic Epoxy, 16-598 Series, Semi-Gloss.
      - 2) PPG Paints Pitt-Glaze WB Water-Borne Acrylic Epoxy, 16-599 Series, Gloss.
      - 3) Sherwin-Williams Pro Industrial Waterbased Catalyzed Epoxy, Gloss. (MPI #115)
      - 4) Sherwin-Williams Waterbased Catalyzed Epoxy, Semi-Gloss.
      - 5) Substitutions: Section 01 6000 - Product Requirements.
- D. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Shop primer by others.
  2. One top coat.
  3. Top Coat: Alkyd Dry Fall; MPI #55, 89, or 225.
    - a. Products:
      - 1) PPG Paints Speedhide Alkyd Dry-Fog, 6-160XI, Flat. (MPI #55)
      - 2) Sherwin-Williams Dryfall Flat. (MPI #55)
      - 3) Substitutions: Section 01 6000 - Product Requirements.
- E. ----- The systems that follow are intended to be used to define very specific situations -----
- F. Paint MI-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
  2. Semi-gloss: Two coats of alkyd enamel; [\_\_\_\_\_].
- G. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer.
  2. Semi-gloss: Two coats of latex enamel.
- H. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:

1. Touch-up with latex primer.
2. Semi-gloss: Two coats of latex enamel.
- I. Paint Mgl-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
  1. One coat galvanize primer.
  2. Semi-gloss: Two coats of alkyd enamel.
- J. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
  1. One coat of alkyd primer sealer.
  2. Flat: Two coats of latex enamel-acrylic.
- K. Paint FI-OP-2A - Fabrics/Insulation Jackets, Alkyd, 2 Coat:
  1. One coat of alkyd primer sealer.
  2. Flat: One coat of alkyd enamel.

### **3.04 PRIMERS**

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
  1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
    - a. Products:
      - 1) PPG Paints Pure Performance Interior Latex Primer, 9-900.
      - 2) Pratt & Lambert Pro-Hide Gold Interior Latex Zero VOC Primer. (MPI #149)
      - 3) Valspar Professional Interior Latex Primer, No. 11286. (MPI #149)
      - 4) Substitutions: Section 01 6000 - Product Requirements.
  2. Interior/Exterior Latex Block Filler; MPI #4.
    - a. Products:
      - 1) Kilz Pro-X p50 Block Filler Primer.
      - 2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15. (MPI #4)
      - 3) Pratt & Lambert Pro-Hide Silver Interior/Exterior Latex Block Filler.
      - 4) Valspar Professional Block Filler, No. 589 Series. (MPI #4)
      - 5) Substitutions: Section 01 6000 - Product Requirements.
  3. Interior Latex Primer Sealer; MPI #50.
    - a. Products:
      - 1) Behr Premium Plus Interior All-In-One Primer and Sealer [No. 75]. (MPI #50)
      - 2) PPG Paints Speedhide Interior Latex Sealer, 6-2. (MPI #50)
      - 3) Pratt & Lambert Multi-Purpose Waterborne Primer. (MPI #50)
      - 4) Valspar Professional Interior Latex Primer, No.11286. (MPI #50)
      - 5) Substitutions: Section 01 6000 - Product Requirements.
  4. Interior Drywall Primer Sealer.
    - a. Products:
      - 1) Behr Premium Plus Interior Drywall Primer and Sealer [No. 73].
      - 2) PPG Paints Speedhide Pro-EV Latex Sealer, 12-900.
      - 3) Rodda Vapor Block Interior Perm Rated Latex Primer/Sealer, 507901.
      - 4) Substitutions: Section 01 6000 - Product Requirements.
  5. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
    - a. Products:
      - 1) PPG Paints Speedhide Interior/Exterior Rust Inhibitive Steel Primer, 6-212 Series. (MPI #79)
      - 2) Valspar Armor Anti-Rust Oil Metal Primer, No. 21852. (MPI #79)
  6. Interior Water Based Primer for Galvanized Metal; MPI #134.
    - a. Products:
      - 1) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #134)
      - 2) PPG Paints Pitt-Tech Plus DTM Industrial Primer, 90-912 Series. (MPI #134)



### **3.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **4.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Masonry Units : 12 percent.
  - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

### **4.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
  - 1. Clean concrete according to ASTM D4258. Allow to dry.
- F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- H. Galvanized Surfaces:
- I. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### **4.03 APPLICATION**

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

#### **4.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

**END OF SECTION**

**SECTION 09 9600  
HIGH-PERFORMANCE COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. High performance coatings.
- B. Surface preparation.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 9113 - Exterior Painting.
- B. Section 09 9123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

**1.03 REFERENCE STANDARDS**

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).

- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1 2016.
- E. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual Volume 2 2021.
- F. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals 2016.
- G. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- H. SSPC-SP 13 - Surface Preparation of Concrete 2018.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
- C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

#### **1.05 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document that applies to application on site.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- C. Restrict traffic from area where coating is being applied or is curing.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Warranty: Include coverage for bond to substrate.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.
- B. Provide high performance coating products from the same manufacturer to the greatest extent possible.
  - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

- C. High-Performance Coatings:
  - 1. Dow Corning Corporation:
  - 2. PPG Paints: [www.ppgpaints.com](http://www.ppgpaints.com).
  - 3. Sika Corporation; Sikagard Hygiene Urethane Wall System:
  - 4. Sherwin-Williams Company:
  - 5. Tnemec Company, Inc:
  - 6. Substitutions: Section 01 6000 - Product Requirements.

## 2.02 HIGH-PERFORMANCE COATINGS

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

## 2.03 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
- B. Latex Coating:
  - 1. Number of Coats: Two.
  - 2. Top Coat(s): Latex, Interior, High Performance Architectural; MPI #139.
    - a. Sheen: Eggshell.
    - b. Products:
      - 1) PPG Paints; Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-310 Series: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy; MPI #139, 141: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle).
  - 3. Primer: As recommended by coating manufacturer for specific substrate.
- C. Elastomeric Coating:
  - 1. Number of Coats: Two.
  - 2. Top Coat(s): Exterior Pigmented Elastomeric, Water Based; MPI #113.
    - a. Sheen: Flat.
    - b. Products:
      - 1) Dow Chemical Company; ALLGUARD Silicone Elastomeric Coating: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
      - 2) PPG Paints Perm-Crete Pitt-Flex Elastomeric Coating, 4-110 Series: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 3) Substitutions: Section 01 6000 - Product Requirements.
  - 3. Primer: As recommended by coating manufacturer for specific substrate.
- D. Epoxy Coating:
  - 1. Number of coats: Two.
  - 2. Top Coat(s): Polyamide Epoxy; MPI #77.
    - a. Sheen: Semi-Gloss.
    - b. Products:
      - 1) PPG Paints; Aquapon 35 Polyamide Epoxy Gloss, 95-1 Series; MPI #77:
      - 2) Pratt & Lambert; Industrial Palgard Polyamide Epoxy:
      - 3) Sherwin-Williams; Macropoxy 646 Fast Cure Epoxy; MPI #177:
      - 4) Substitutions: Section 01 6000 - Product Requirements.
  - 3. Top Coat(s): Epoxy-Modified Latex; MPI #115.
    - a. Sheen: Semi-Gloss.
    - b. Products:
      - 1) PPG Paints; Pitt-Glaze WB Water-Borne Acrylic Epoxy 16-598 Series, Gloss/16-599 Series, Semi-Gloss: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Sherwin-Williams; Pro Industrial Water Based Catalyzed Epoxy; MPI #115: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle).

- 3) Substitutions: Section 01 6000 - Product Requirements.
4. Primer: As recommended by coating manufacturer for specific substrate.
- E. Urethane Coating:
  1. Number of Coats: Two.
  2. Top Coat(s): Polyurethane, Two-Component; MPI #72.
    - a. Sheen: Semi-Gloss.
    - b. Products:
      - 1) PPG Paints Pitthane Ultra Polyurethane Enamel, Gloss, 95-8001 Series; MPI #72: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Sherwin-Williams; Acrolon 218 HS; MPI #72, 174: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle).
      - 3) Substitutions: Section 01 6000 - Product Requirements.

## 2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by coating manufacturer.
  1. Primer Sealer, Latex, Interior; MPI #50.
    - a. Products:
      - 1) PPG Paints; Speedhide zero Interior Latex Sealer, 6-4900XI; MPI #50: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer; MPI #50: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle).
      - 3) Substitutions: Section 01 6000 - Product Requirements.
  2. Block Filler, Epoxy; MPI #116.
    - a. Products:
      - 1) PPG Paints; Amerlock 400 Epoxy Block Filler, 400BF: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Substitutions: Section 01 6000 - Product Requirements.
  3. Block Filler, Latex; MPI #4.
    - a. Products:
      - 1) PPG Paints; Speedhide Masonry Hi Fill Latex Block Filler, 6-15; MPI #4: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Sherwin-Williams; Heavy Duty Block Filler; MPI #4: [www.protective.sherwin-williams.com/#sle](http://www.protective.sherwin-williams.com/#sle).
  4. Anti-Corrosive for Metal, Epoxy; MPI #101.
    - a. Products:
      - 1) PPG Paints; Amerlock 400 Epoxy, Semi-Gloss, AK-400 Series:
      - 2) Substitutions: Section 01 6000 - Product Requirements.
  5. Pre-Primer, Epoxy.
    - a. Products:
      - 1) PPG Paints; Amerlock Sealer:
      - 2) Pratt & Lambert; Industrial Epoxy Pre-Prime:
      - 3) Substitutions: Section 01 6000 - Product Requirements.
  6. Rust-Inhibitive, Water Based; MPI #107.
    - a. Products:
      - 1) PPG Paints; Pitt-Tech Plus DTM Industrial Primer, 90-912 Series; MPI #107: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
      - 2) Substitutions: Section 01 6000 - Product Requirements.

## 2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.
  - 2. Plaster and Stucco: 12 percent.
  - 3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
  - 4. Concrete Floors and Traffic Surfaces: 8 percent.
  - 5. Wood: Do not begin application if substrate has moisture content over 12 percent.

### **3.02 PREPARATION**

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Concrete:
  - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 2. Prepare surface as recommended by coating manufacturer and according to SSPC-SP 13.
- E. Masonry:
  - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
  - 2. Prepare surface as recommended by coating manufacturer.
- F. Galvanized Surfaces:
  - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- G. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP1.
  - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.
- H. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

### **3.03 PRIMING**

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

### **3.04 COATING APPLICATION**

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

### **3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

### **3.06 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

### **3.07 PROTECTION**

- A. Protect finished work from damage.

**END OF SECTION**



## **SECTION 10 1400 SIGNAGE**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Room and door signs.
- B. Directional and informational signs.
- C. Dimensional Letter signs.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 26 5100 - Interior Lighting: Exit signs required by code.

#### **1.03 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 - 2010 ADA Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

#### **1.04 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. 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.
- D. 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.
- E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation.
- C. 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.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Flat Signs: Grip Lock as designated on Contract Drawings.
- B. Dimensional Letter Signs:
  - 1. Cosco Industries; Cast Aluminum:
  - 2. FASTSIGNS:
  - 3. Inpro:
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

## **2.02 SIGNAGE APPLICATIONS**

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
  - 1. Sign Type: Flat signs with engraved panel media as specified.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  - 3. Character Height: 1 inch.
  - 4. Sign Height: 2 inches, unless otherwise indicated.
  - 5. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
  - 6. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- C. Directional and Informational Signs:
  - 1. Sign Type: Same as room and door signs.
  - 2. Wording of signs is scheduled on drawings.
- D. Building Identification Signs:
  - 1. Use individual metal letters.
  - 2. Mount in locations indicated on drawings.

## **2.03 SIGN TYPES**

- A. Flat Signs: Signage media without frame.
  - 1. Edges: Square.
  - 2. Corners: Square.
  - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
  - 4. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
- B. Color and Font: Unless otherwise indicated: Refer to contract drawings
  - 1. Character Font: Helvetica.
  - 2. Character Case: Upper case only.

## **2.04 TACTILE SIGNAGE MEDIA**

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

## **2.05 DIMENSIONAL LETTERS**

- A. Metal Letters: Refer to contract drawings for specific verbiage, size and location.
  - 1. Metal: Aluminum casting.
  - 2. Letter Height: 6 inches.
  - 3. Text and Typeface:
    - a. Character Font: Match font of existing Concessions Building.
    - b. Character Case: Upper case only.
  - 4. Finish: Brushed, satin.
  - 5. Mounting: Concealed screws.

## **2.06 ACCESSORIES**

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Exposed Screws: Chrome plated.
- C. Tape Adhesive: Double sided tape, permanent adhesive.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

**END OF SECTION**

**SECTION 10 2113.19  
PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal and vestibule screens.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.
- B. Section 10 2800 - Toilet Accessories.

**1.03 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
  - 1. ASI Global Partitions:
  - 2. Scranton Products; Hiny Hiders Partitions:
  - 3. Substitutions: Section 01 6000 - Product Requirements.

**2.02 PLASTIC TOILET COMPARTMENTS**

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
  - 1. Doors:
    - a. Thickness: 1 inch.
    - b. Width: 24 inch.
    - c. Width for Handicapped Use: 36 inch, out-swinging.
    - d. Height: 55 inch.
  - 2. Panels:
    - a. Thickness: 1 inch.
    - b. Height: 55 inch.
  - 3. Pilasters:
    - a. Thickness: 1 inch.
    - b. Width: As required to fit space; minimum 3 inch.

**2.03 ACCESSORIES**

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.

1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
  2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Head Rails: Extruded aluminum, anti-grip profile.
1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
- E. Hinges: Stainless steel, manufacturer's standard finish.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
1. Door Latch: Slide type with exterior emergency access feature.
  2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
  3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

#### **3.02 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

#### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

#### **3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**

**SECTION 10 2600  
WALL AND DOOR PROTECTION**

**<<<< UPDATE NOTES**

**PART 1 GENERAL**

**2.01 SECTION INCLUDES**

- A. Corner guards.
- B. Protective wall covering.

**2.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Anchors for attachment of work of this section, concealed in wall.
- B. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.
- C. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.
- D. Section 09 2216 - Non-Structural Metal Framing: Placement of supports in stud wall construction.

**2.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions and features.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
  - 1. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches square.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- F. 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 Stock Materials: 100 square feet of protective wall covering.

**2.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in conformance with manufacturer's recommendations for each type of item.

**2.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**3.01 MANUFACTURERS**

- A. Corner Guards:
  - 1. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 2. Korogard Interior Products:
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Protective Wall Covering:
  - 1. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 2. Korogard Interior Products.

### 3.02 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
  - 1. Material: High impact vinyl with full height extruded aluminum retainer.
  - 2. Width of Wings: 2 inches.
  - 3. Corner: Square.
  - 4. Color: As selected from manufacturer's standard colors.
  - 5. Length: One piece.
- B. Protective Wall Covering:
  - 1. Material: High-impact acrylic-modified vinyl.
  - 2. Thickness: 0.040 inch.
  - 3. Color: As selected from manufacturer's standard colors.
- C. -----
- D. -----
- E. Adhesives and Primers: As recommended by manufacturer.
- F. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.
- G. See Section 06 1000 for wood blocking for wall and corner guard anchors.

### 3.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

### 3.04 SOURCE QUALITY CONTROL

- A. Provide wall and door protection systems of each type from a single source and manufacturer.

## PART 3 EXECUTION

### 4.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

### 4.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches above finished floor to ceiling.
- C. Coordinate installation of vinyl fabric wall covering specified in Section 09 7200 with corner guard retainer and cover.

**END OF SECTION**

**SECTION 10 2800  
TOILET ACCESSORIES**

**PART 1 GENERAL**

**REFER TO CONTRACT DRAWINGS SPECIALTIES SCHEDULE FOR SPECIFIC ACCESSORIES NOT OTHERWISE SPECIFIED HEREIN OR ELSEWHERE. COORDINATE ITEMS TO BE OWNER PROVIDE/CONTRACTOR INSTALLED OR OWNER PROVIDED OWNER INSTALLED.**

**2.01 RELATED REQUIREMENTS**

- A. Section 06 10 00 Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

**2.02 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2022).
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.
- E. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2022.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

**2.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

**2.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

**PART 2 PRODUCTS REFER TO CONTRACT DRAWINGS SPECIALTY SCHEDULE.**

**PART 3 EXECUTION**

**4.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

**4.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

**4.03 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.



C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

#### **4.04 PROTECTION**

A. Protect installed accessories from damage due to subsequent construction operations.

**END OF SECTION**

**SECTION 10 4400  
FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 09 9123 - Interior Painting: Field paint finish.

**1.03 REFERENCE STANDARDS**

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- B. NFPA 10 - Standard for Portable Fire Extinguishers 2022.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, installation procedures, and accessories required for complete installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
  - 1. Larsen's Manufacturing Co.:
  - 2. Kidde, a unit of United Technologies Corp:
  - 3. Nystrom, Inc.
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
  - 1. Larsen's Manufacturing Co[<>]: :
  - 2. Kidde, a unit of United Technologies Corp: [www.kidde.com](http://www.kidde.com).
  - 3. Nystrom, Inc.
  - 4. 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.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
  - 1. Class: A:B:C type.
  - 2. Size: 10 pound.
  - 3. Finish: Baked polyester powder coat, color as selected.
  - 4. Temperature range: Minus 40 degrees F to 120 degrees F.

**2.03 FIRE EXTINGUISHER CABINETS**

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
  - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- C. Fire Rated Cabinet Construction: One-hour fire rated.
  - 1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

- D. Cabinet Configuration: Semi-recessed type.
  - 1. Size to accommodate accessories.
  - 2. Trim: Flat square edge, with 2 1/2 inch wide face.
- E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
- F. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- H. Weld, fill, and grind components smooth.
- I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- J. Finish of Cabinet Interior: White colored enamel.

### **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. Secure rigidly in place.
- C. Place extinguishers in cabinets.

**END OF SECTION**

## **SECTION 10 7316.13 METAL CANOPIES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Rod braced and shop fabricated prefinished aluminum canopies.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 09 9113 - Exterior Painting: Finish coating.
- B. Section 09 9600 - High-Performance Coatings: Finish coating.

#### **1.03 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.
- C. ASTM E2950 - Standard Specification for Metal Canopy Systems 2014 (Reapproved 2020).

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
- D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 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.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.
- C. Finish Warranty: Provide manufacturer's one year warranty on factory finish against cracking, peeling, and blistering.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Metal Canopies:
  - 1. Mapes Canopies: Includes all materials for complete installation, brace rods and wall plates, fascia, decking and all appurtenances. Refer to contract drawings for design intent.
  - 2. Masa Extrudeck system. Includes all materials for complete installation, brace rods and wall plates, fascia, decking and all appurtenances. Refer to contract drawings for design intent.
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 METAL CANOPIES**

- A. Shop Fabricated Aluminum Canopy

1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
  - a. Loads: In compliance with local building codes.
2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

### **2.03 SHOP FABRICATION**

- A. Provide a complete system ready for erection at project site.
- B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
- C. Fabricate connections for bolt, nut, and washer connectors.

### **2.04 FINISHES**

- A. Aluminum: Manufacturer's standard. Color to be selected by architect.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Do not proceed with installation until all conditions are satisfactory.

### **3.02 TOLERANCES**

- A. Maximum Variation from Level: Plus/Minus 1/8 inch.

### **3.03 CLEANING**

- A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

### **3.04 PROTECTION**

- A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

**END OF SECTION**

**SECTION 11 4001  
CUSTOM FABRICATED FOODSERVICE EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Custom fabricated stainless steel units, including:
  - 1. Serving counters.
  - 2. Food preparation tables.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9200 - Joint Sealants: Sealing joints between equipment and adjacent walls, floors, and ceilings.

**1.03 REFERENCE STANDARDS**

- A. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications 2022b.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.
- C. ASTM A270/A270M - Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing 2015 (Reapproved 2019).
- D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- F. ASTM B32 - Standard Specification for Solder Metal 2020.
- G. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.
- H. NSF 2 - Food Equipment 2021.
- I. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines 2001.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each manufactured product to be used, including:
- C. Shop Drawings: Submit floor plans, elevations, cross-sections, and construction details for fabricated units specified, including:
  - 1. Layout and anchorage of equipment and accessories, including clearances for maintenance and operation and required electrical or plumbing connections.
  - 2. Special conditions, including required slab depressions, cores, wall openings, blockouts, ceiling pockets, access panels, and above ceiling hanger assemblies.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver fixed equipment that is not to be integrated into structure until after completion of finished ceilings, floor and walls, painting, and lighting.
- B. Store products in manufacturer's unopened packaging until ready for installation.

**1.06 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 MATERIALS**

- A. Stainless Steel: 18-8 percent chromium-nickel composition, minimum; alloy Type 302, 304, or 316; No. 4 - Brushed finish on exposed surfaces.
  - 1. Sheets: ASTM A240/A240M or ASTM A666.
  - 2. Tubing: ASTM A269/A269M or ASTM A270/A270M; of true roundness with seams and welds ground smooth.
  - 3. Bars: ASTM A276/A276M.
- B. Sound Deadening Material: Bituminous paint or other water resistant mastic.
- C. Manufactured Components:
  - 1. Finish Hardware: Manufacturer's standard; stainless steel with satin finish.
  - 2. Feet for Legs: Bullet shaped stainless steel; screwed into tubular legs with concealed screw threads; minimum 1 inch vertical adjustment.
- D. Bolts, Screws, and Rivets: Stainless steel; do not use on exposed surfaces unless specifically indicated or unavoidable.
  - 1. Bolt and Screw Caps: Provide lock washer and chromium-plated brass/bronze acorn nut to cap visible or exposed threads on inside of fixtures.
- E. Anchoring Devices: Stainless steel, of type appropriate for use; provide seismic anchorage as specified in SMACNA (KVS).

### **2.02 CUSTOM FABRICATED UNITS - GENERAL REQUIREMENTS**

- A. See drawings for dimensions and configurations; ensure proper fit by taking field measurements prior to fabrication.
- B. Provide fully shop assembled units conforming to SMACNA (KVS) and NSF 2, unless indicated otherwise, and provide stainless steel components unless indicated otherwise.
  - 1. Where details are referenced as "SMACNA" details, refer to SMACNA (KVS).
  - 2. Stainless Steel Sheet: For surfaces up to 12 feet in length provide one continuous sheet without joints or welds, including back and end splashes.
  - 3. Joints: Provide welded joints unless specifically indicated or not possible; do not solder or braze stainless steel; do not use bolts, screws, or other fasteners on work surfaces, food contact surfaces, or wet surfaces.
  - 4. Shop prepare openings for plumbing fixtures, fittings, and other service components.
  - 5. Sound Deadening: Apply sound deadening material to accessible internal surfaces of metal work and underside of metal counters and sinks.
- C. Counter and Table Tops: Stainless steel, 14 gage, 0.0747 inch thick, minimum; with underbracing as recommended by SMACNA (KVS), and bullnose edges and 45-degree back and end splashes, unless otherwise indicated.
- D. Back and End Splashes: Provide wherever tops abut walls or other vertical surfaces; close open ends from top to bottom of turned down top edge.
  - 1. 45 Degree Back and End Splashes: 6 inches high, coved at 5/8 inch radius, turned back 2 inches at the top at 45 degree angle, turned down 1 inch.
- E. Legs: Stainless steel tubing, 1-5/8 inches outside diameter; fit legs with set-screw fastened sockets and adjustable feet as specified.
  - 1. Legs Over 12 inches Long: 14 gage, 0.065 inch, minimum, wall thickness.
  - 2. Unless otherwise indicated provide legs for all units.
- F. Shelves: Stainless steel.
  - 1. Undercounter Shelves: 16 gage, 0.0598 inch thick.
  - 2. Overshelves: 16 gage, 0.0598 inch thick.
  - 3. Overshelf Supports: Stainless steel tubing extending through table top and shelving, 12 gage, 0.1046 inch.

4. Wall Mounted Shelf Supports: Stainless steel, 14 gage, 0.0747 inch thick.

## **2.03 SERVING COUNTERS**

- A. Serving Counter Height:
  1. Non-Self-Service: 34 inch.

## **2.04 FABRICATION**

- A. Joints, Bends, and Edges: Make each joint close fitting, especially butt and contact joints.
  1. Make brake bends free of open-texture or orange peel appearance.
  2. Make sheared edges free of burrs, projections, and fins.
- B. Welding: Make each welded joint smooth, ductile, and watertight, without gaps, holes, or discoloration or marring of surface adjacent to welds.
  1. Use welding processes and filler metal compatible with material being welded. Do not use carbon arc welding on surfaces that will be exposed to view in finished work.
- C. Brazing of Copper Tubing to Brass and Bronze Fittings: Use silver solder, and do not braze stainless steel.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with fabricator's instructions and recommendations, plumb and level and in proper locations, ready for utility connections.
- B. Lay out work in advance to prevent damage to building, piping, wiring, or equipment; cut, fit, and patch where necessary; coordinate work with others.
- C. Do not cut or fit units in the field; if adjustments are necessary due to inadequate field measurement prior to fabrication, take unit back to shop and perform modifications there.
- D. Do not field weld unless absolutely necessary; weld and grind field joints in accordance with specified fabrication procedures.
- E. Securely anchor and attach non-mobile or adjustable-leg equipment to walls, floors, or bases with stainless steel bolts.

### **3.02 CLEANING**

- A. Remove masking or protective covering from stainless steel and other finished surfaces.
- B. Clean equipment to condition suitable for food preparation use.

### **3.03 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

### **END OF SECTION**



**SECTION 12 6600  
FIXED ALUMINUM BLEACHERS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract; including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.
- B. **SCOPE OF WORK:**
  - 1. Provide labor, materials, equipment, engineering, installation to provide a new custom aluminum bleacher system in accordance with the following specifications:
- C. **Minimum acceptable criteria:**
  - 1. Design per plan view and sectional view drawings.
  - 2. The overall length of grandstand shall be as per architectural drawings.
  - 3. The number of rows shall be as per architectural drawings.
  - 4. Height of front walkway from grade shall be as per architectural drawings.
  - 5. Width of front walkway to be as per architectural drawings.
  - 6. The rise per row shall be as per architectural drawings.
  - 7. The depth per row shall be as per architectural drawings.
  - 8. Net seating capacity shall be as per architectural drawings.
  - 9. The riser shall be structurally connected to the decking system panel every 12" longitudinal with ¼" diameter structural grade rivet.
  - 10. There shall be no gaps or cavities between the riser portion of the decking system and any supports or attachments.
  - 11. ADA seating shall be as per architectural drawings.
  - 12. Aluminum extrusions using alloy 6063-T6 and 6061-T6.
  - 13. Understructure members shall be constructed using square tube and aluminum angle extrusions. Vertical columns should have a dimension of 2" x 2" and a minimum wall thickness of 1/8" on all columns except the terminal column which should be 3"x 2". The footboard supports and bases angles should be 2" x 1.1/2"x 3/16" aluminum angle. All diagonal bracing should be 1.1/2" x 1.1/2" x 3/16" aluminum angle.
  - 14. All mating connections to create the understructure framing system shall be welded connections and shall be welded on all sides.
  - 15. All welded connections shall be by certified aluminum welders
  - 16. All understructure frames shall be treated after fabrication by a system that employs a commercial cleansing and rinse procedure.
  - 17. Aisle and Egress stairs shall have a ½" overlap.
  - 18. At locations where platforms meet end to end a beveled four inch wide aluminum threshold extrusion shall be provided to cover the walking surface.
  - 19. Seat support system shall be universally adjustable to any location on the vertical plane of the decking system.
  - 20. All seat support, aisle step supports, aisle handrails and risers shall be installed from the topside of the decking system. There shall be no through bolting of these items through the riser system.
  - 21. Guardrail system shall be constructed with all-aluminum support posts and railings with galvanized/vinyl coated chain link fencing.
  - 22. Bleacher manufacture must have a written quality control program for manufacturing, shipping and installation.
  - 23. Walking surface shall be fluted non-skid and slip resistant.
  - 24. Related Sections include the following:
    - a. Division 3 Section "Cast-in place Concrete" for concrete mix design and testing requirements.
- D. **SYSTEM PERFORMANCE REQUIREMENTS:**

1. General: Provide a complete, custom bleachers system mutually dependent components and assemblies that form a custom system capable of with standing structural and other loads, thermally induced movement, and exposure to weather without failure. Include primary and secondary framing, decking system, seating, handrails /guardrails, press box and accessories complying with requirements indicated, including those in this Article.
2. Structural Performance: Provide bleacher system capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - a. Design Loads / Structural - Framing Members
    - 1) Dead Loading: 6 PSF for understructure
    - 2) Live Loads: 100 PSF for understructure
  - b. Design Loads / Decking System
    - 1) Dead Loading: 6 PSF for decking, platforms, stairs and ramps
    - 2) Live Loads: 100 PSF for decking, platforms, stairs and ramps
    - 3) Deflection Limits: engineer assemblies to withstand design loads with deflections no greater than the following:
      - (a) Decking, platforms, stairs and ramps: vertical deflection of L/360
    - 4) Sway loads of 24 PLF per row parallel to seat and 10 PLF per row perpendicular to seat run.
  - c. Design Loads / Handrail / Guardrail
    - 1) 100 PLF Vertical
    - 2) 50 PLF applied in any direction
    - 3) 200 LB Concentrated load any direction
    - 4) 50 PSF fencing and infill
  - d. Design Loads / Seat Boards
    - 1) Live Loads: ( vertical) 120 pounds per lineal foot

**E. SUBMITTALS:**

1. Shop Drawings: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following grandstand system components:
  - a. Foundations:
    - 1) Footings, slab and reinforcement.
    - 2) Structural framing:
      - (a) Primary and secondary framing including but not limited to the following:
        - (1) Vertical & Horizontal Members
        - (2) Bracing
        - (3) Connecting hardware
    - 3) Tredweld Decking System:
      - (a) Decking Platforms
      - (b) Risers
      - (c) Supports for Seats
      - (d) Aisle Steps
      - (e) Aisle Handrails
        - (1) Egress Stairs
        - (2) Hardware
    - 4) Seating
    - 5) Handrails / Guardrails
    - 6) Ramps

**F. QUALITY ASSURANCE:**

1. A. Concrete Installers Qualifications: An experienced installer who has completed concrete work similar in material, design and extent indicated for this project and whose work has resulted in construction of bleacher system with a record of successful in-service performance. Concrete install must be certified by bleacher manufacturer.

2. Erector Qualifications: An experienced erector who has specialized in
  - a. installing bleacher system similar in material, design, and extent to that indicated for this Project. Bleacher erector must be certified by bleacher manufacturer.
  - b. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of bleacher systems that are similar to those indicated for this Project in material, design and extent. All approval drawings shall bear the seal of a registered professional engineer in the state of installation.
  - c. Quality Control: Manufacturer's written quality control for manufacturing, shipping and installation shall be submitted prior to award of contract.
  - d. Standards and Guidelines: Comply with the provisions of the following
  - e. codes, specifications and standards, latest editions, except as otherwise noted or specified:
    - 1) American Concrete Institute (ACI)
    - 2) Aluminum Association of American
    - 3) American Welding society (AWS)
    - 4) Americans with Disabilities Act (ADA)
    - 5) International Building Code (IBC)
    - 6) International Code Council 300 (ICC 300)
    - 7) C. Site visitation: Bidder shall visit the job site prior to the bid date. At the time of visitation, bidder must verify site conditions.

**G. DELIVERY, STORAGE AND HANDLING:**

1. Package all items for protection during transportation and handling.
2. Do not store items on the job site in contact with other materials that might cause staining, denting or other surface damage.

**H. WARRANTY:**

- I. All products shall carry, after proper erection, and under normal use for the type of structure a one (1) year warranty against all defects in materials and workmanship.

**2.01 MANUFACTURER**

- A. Sturdiesteel
- B. Southern Bleacher
- C. GT Grandstands
  1. CONCRETE FOUNDATIONS
    - a. Foundations shall be designed in accordance with mix designs.
    - b. Foundations shall be concrete piers as shown on contract drawings.
  2. UNDERSTRUCTURE:
    - a. The understructure of the system shall consist of a series of aluminum frames spaced at intervals of no more than 6'-0" and joined by means of aluminum sway braces.
    - b. Each stringer shall consist of vertical members, adequate diagonal braces, and horizontal members welded to form the proper rise per row and proper back to back spacing between seat rows.
    - c. All welded connections shall be by certified aluminum welders, and all mating parts shall be welded on all sides to assure adequate strength.
    - d. Vertical members shall be constructed on 2" x 2" x 1/8" square tube aluminum for all columns except the terminal column which should be 3" x 2" x 1/8" square tube aluminum, alloy 6061-T6, mill finish.
    - e. Horizontal members shall be constructed of 2" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish.
      - 1) Sway braces shall be constructed of 1.5" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish.

3. DECKING SYSTEM:

- a. Decking System Platforms shall consist of extrusions laid side by side to form the tread width. These individual extrusions shall be the interlocking type. The treads shall be welded in a single pass with .0035 diameter 4043 welding wire, using argon gas. This method will result in a rigid, positively joined tread. Individual tread lengths shall be a maximum length of 37'-6" with the actual length designed to create the minimum number of expansion seams. Decking shall be attached to the supporting aluminum tube understructure by means of concealed aluminum clips, galvanized bolts, washers and nuts.
- b. Platforms shall have a minimum aluminum wall thickness of .078" and aluminum shall be alloy 6063-T6.
- c. Walking surface shall be fluted non-skid and slip resistant.
- d. The rear portion of the platform will turn ninety degrees vertical to accept the next row of decking platforms. The front portion of the platform shall be complete with a female front edge to allow for a positive male / female connection of a vertical riser.
- e. At locations where platforms meet end to end a beveled four inch wide aluminum threshold extrusion shall be provide to cover the walking surface. Threshold shall be beveled on both sides so as not to create a trip hazard and must have a fluted surface to prevent slipping. Threshold must comply with specified deflection criteria and once installed must allow for expansion and contraction.
- f. Decking System Riser
  - 1) The decking system riser shall be extruded aluminum; alloy 6063-T6 with a 204 R1 anodized clear finish.
  - 2) This extrusion shall have a male ridge running continuous at the upper leading edge to interlock with the front portion of the decking system panel.
  - 3) The riser shall be structurally connected to the decking system panel every 12" longitudinal with 1/4" diameter structural grade rivet.
  - 4) There shall be no gaps or cavities between the riser portion of the decking system and any supports or attachments.
- g. Decking System Seat Supports
  - 1) The decking system seat support shall be of extruded aluminum angle.
  - 2) Once installed the seat support shall have no noticeable gaps between the decking system riser and support.
  - 3) Seat support system shall be universally adjustable to any location on the vertical plane of the decking system.
- h. Decking System Aisle Handrails
  - 1) The decking system aisle handrails shall be 1-5/8" schedule 40 anodized aluminum pipe.
  - 2) Handrails shall have a center line handrail and the spacing between rails shall not be less than 22" or more than 36". Handrails shall be discontinuous and shall not span more than five rows of seating.
- i. Decking System Egress Stairs
  - 1) The decking system egress stair stringers are to be constructed of 8" aluminum channel, alloy 6061-T6. Tread supports to be welded to 8" member to totally cap the end of the 2" x 12" stair tread against the channel web.
  - 2) Walking surface of tread shall be complete with female front edge to allow for positive male / female connection of the riser closure. All risers to be fastened to the rear tail of the stair tread with 1/4" diameter structural grade rivet.
  - 3) Stair tread nosing to be anodized black. Nosing shall have no external fasteners.
  - 4) Stair grab rail to be constructed of 1-5/8" schedule 40 anodized aluminum pipe with no fittings at transition from sloped system to grade.
- j. Decking System Hardware
  - 1) All bolts, washers and nuts shall be galvanized.

- 2) End caps shall be of a heavy duty, clamping, aluminum channel design fastened to the ends of extrusions with aluminum rivets. End caps shall close all end openings of extrusions and shall be a full-length piece and match in both color and finish the extrusion to which they attach.
  - 3) All riser fasteners shall be structural 1/4" diameter structural grade rivet.
4. SEATING AND OPTIONS
- a. Bench Seating
    - 1) Material: Aluminum bench seating material
      - (a) Color: Anodized aluminum
    - 2) Bench Width: Not less than 21 inches or more than 22 inches.
    - 3) Bench Depth: 10 inches to 12 inches as indicated on drawings.
    - 4) Seats: None in this project
    - 5) Chair Backs: None in this project
    - 6) Rail System: Channel-shaped 6063-T6 alloy structural aluminum.
    - 7) Cross-Bracing: T-shaped 6063-T6 structural aluminum.
    - 8) Mount Connectors: Connectors shall be 3/8" x 1" rust-resistant silver stalgard-coated, wide flange, lock bolts and lock nuts.
  - b. Wheelchair-Accessible Seating: Locate seating cutouts to provide wheelchair-accessible seating at locations indicated on Drawings.
    - 1) Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300 - 2012 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands.
    - 2) Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches from finished floor.
  - c. Optional Seat and Row Lettering
    - 1) Row numbering shall be clearly and permanently marked with material providing a high contrast, high-resolution mark.
    - 2) Row lettering shall be marked on the end caps.
- D. HANDRAILS / GUARDRAILS
1. All railing shall consist of 1-5/8" schedule 40 anodized pipe.
  2. All pipe fittings shall be of cast aluminum.
  3. Guardrail supports to be 3" aluminum channel, alloy 6061-T6.
  4. Rail pipe shall be secured to the guardrail support by means of galvanized tension bands.
  5. The top rail shall be 42" minimum above the nearest seat on the sides and rear, and 42" above the tread on the front walkway.
  6. Handrails on stairs shall be 34" above the leading most edge of the stair tread.
  7. Handrails and guardrails shall be provided on the front, sides and rear of the grandstand and at all egress areas to match the picket style shown in the drawings.
  8. Handrails shall be provided at all walking areas and shall extend 1-1/2" from guardrail material. Standoff shall be extruded aluminum, alloy 6061-T6
  9. Handrails shall have internal sleeves for splice purposes and finished rail shall be continuous and shall not exceed 1-5/8" diameter.
- E. RAMPS
1. Wheel chair accessible ramps with a minimum 60" clear width and a maximum 1:12 slope shall be provided, conforming to code.
  2. Understructure shall be constructed of same materials as bleacher support structure.
  3. Decking and handrails shall be constructed of same materials as bleacher decking.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Before erection proceeds, certified bleacher installer will survey elevations and locations of concrete pads or runners to verify compliance with requirements and bleacher manufacturer's tolerances.

**B. ERECTION**

1. Erect bleacher system according to manufacturer's written instructions and erection drawings.
2. Do not field cut, drill or alter structural members without written approval from bleacher system manufacturer's professional engineer.
3. Set structural framing in locations as indicated.
4. **CLEANING AND PROTECTION**
  - a. Clean all metal surfaces promptly after installation of work.
  - b. Exercise care to avoid damage to protective coatings and finishes.
  - c. Remove all excess construction material and dispose of all debris.

**END OF SECTION**

**SECTION 22 1113  
FACILITY WATER DISTRIBUTION PIPING**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes private water-distribution piping and related components outside the building for water service and fire-service mains.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.
- C. Public water distribution piping and related components shall conform to City of Medford
- D. Construction Guidelines and Specifications for Water Lines.

**1.03 DEFINITIONS**

- A. EPDM: Ethylene-propylene-diene-monomer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.

**1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

**1.05 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
  - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
  - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

- G. NSF Compliance:
  - 1. Comply with NSF 14 for plastic potable-water-service piping.
  - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

## **1.07 COORDINATION**

- A. Coordinate connection to water main with utility company.

## **PART 2 PRODUCTS**

### **2.01 DUCTILE-IRON PIPE AND FITTINGS**

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Gaskets: AWWA C111, rubber.

### **2.02 PVC PIPE AND FITTINGS**

- A. PVC, Schedule 40 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.
- B. PVC, Schedule 80 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
  - 2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.
- C. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket, and with spigot end.
  - 1. Comply with UL 1285 for fire-service mains if indicated.



2. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

### **2.03 JOINING MATERIALS**

- A. Brazing Filler Metals: AWS A5.8, BCuP Series.
- B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

### **2.04 GATE VALVES**

- A. AWWA, Cast-Iron Gate Valves:
  1. Manufacturers: Subject to compliance with requirements of City of Tulsa.
  2. Nonrising-Stem, Resilient-Seated Gate Valves:
    - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      - 1) Standard: AWWA C509.
      - 2) Minimum Pressure Rating: 200 psig.
      - 3) End Connections: Mechanical joint.
      - 4) Interior Coating: Complying with AWWA C550.

### **2.05 GATE VALVE ACCESSORIES AND SPECIALTIES**

- A. Tapping-Sleeve Assemblies:
  1. Manufacturers: Subject to compliance with requirements of City of Tulsa.
  2. Description: Sleeve and valve compatible with drilling machine.
    - a. Standard: MSS SP-60.
    - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
    - c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
  1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

### **2.06 CHECK VALVES**

- A. AWWA Check Valves:
  1. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
    - a. Standard: AWWA C508.
    - b. Pressure Rating: 175 psig.

### **2.07 CORPORATION VALVES AND CURB VALVES**

- A. Manufacturers:
  1. Manufacturers: Subject to compliance with requirements of City of Tulsa.

- B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
  - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
  - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
  - 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
  - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

## **2.08 WATER METERS**

- A. 1. Water meters will be subject to compliance with requirements of City of Tulsa.

## **2.09 WATER METER BOXES**

- A. 1. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Subject to compliance with requirements of City of Tulsa.

## **2.10 PROTECTIVE ENCLOSURES**

- A. Freeze-Protection Enclosures:
  - 1. Description: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.
    - a. Standard: ASSE 1060.
    - b. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
    - c. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
      - 1) Housing: Reinforced-aluminum or-fiberglass construction.
        - (a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
        - (b) Drain opening for units with drain connection.
        - (c) Access doors with locking devices.
        - (d) Insulation inside housing.
        - (e) Anchoring devices for attaching housing to concrete base.
      - 2) Electric heating cable or heater with self-limiting temperature control.

## **PART 3 EXECUTION**

### **3.01 EARTHWORK**

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### **3.02 PIPING APPLICATIONS**

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

### **3.03 VALVE APPLICATIONS**

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
  - 2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
  - 3. Use the following for valves in vaults and aboveground:
    - a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
    - b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
    - c. Check Valves: AWWA C508, swing type.
  - 4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
  - 5. Relief Valves: Use for water-service piping in vaults and aboveground.
    - a. Air-Release Valves: To release accumulated air.
    - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
    - c. Combination Air Valves: To release or admit air.

### **3.04 PIPING INSTALLATION**

- A. Water-Main Connection: Tap water main according to requirements of City of Tulsa water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:
  - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
  - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
  - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Make connections NPS 2 and smaller with drilling machine according to the following:
  - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
  - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
  - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
  - 4. Install corporation valves into service-saddle assemblies.
  - 5. Install manifold for multiple taps in water main.
  - 6. Install curb valve in water-service piping with head pointing up and with service box.
- D. Comply with NFPA 24 for fire-service-main piping materials and installation.
- E. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

- F. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
- G. Install piping by tunneling by boring, under streets and other obstructions that cannot be disturbed.
- H. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping.
- J. See Division 21 Section "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.
- K. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

### **3.05 JOINT CONSTRUCTION**

- A. Make pipe joints according to the following:
  - 1. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
  - 2. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

### **3.06 ANCHORAGE INSTALLATION**

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
  - 1. Locking mechanical joints.
  - 2. Set-screw mechanical retainer glands.
  - 3. Bolted flanged joints.
  - 4. Heat-fused joints.
  - 5. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
  - 3. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
  - 4. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### **3.07 VALVE INSTALLATION**

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

### **3.08 WATER METER INSTALLATION**

- A. Install water meters, piping, and specialties according requirements of City of Tahlequah.

### **3.09 ROUGHING-IN FOR WATER METERS**

- A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

### **3.10 WATER METER BOX INSTALLATION**

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

### **3.11 PROTECTIVE ENCLOSURE INSTALLATION**

- A. Install concrete base level and with top approximately 2 inches above grade.
- B. Install protective enclosure over valves and equipment.
- C. Anchor protective enclosure to concrete base.

### **3.12 FIRE HYDRANT INSTALLATION**

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. AWWA Fire Hydrants: Comply with AWWA M17.

### **3.13 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.
- C. Connect water-distribution piping to interior domestic water piping.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### **3.14 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests before joints are covered. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
  - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

### **3.15 IDENTIFICATION**

- A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.

### **3.16 CLEANING**

- A. Clean and disinfect water-distribution piping as follows:
  - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in

NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
  - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
  - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
  - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
  - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

**END OF SECTION**

**SECTION 22 1313  
FACILITY SANITARY SEWERS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes gravity-flow, nonpressure, sanitary sewerage outside the building, with the following components:
  - 1. Pipe and fittings.
  - 2. Nonpressure and pressure couplings.
  - 3. Cleanouts.
  - 4. Manholes

**1.03 DEFINITIONS**

- A. EPDM: Ethylene-propylene-diene-monomer rubber.
- B. LLDPE: Linear low-density, polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. TPE: Thermoplastic elastomer.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

**1.05 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Pipe materials.
  - 2. Special pipe fittings.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Do not store plastic pipe and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

**2.02 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS**

- A. Pipe: AWWA C151, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

**2.03 PVC PIPE AND FITTINGS**

- A. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

**2.04 ABS PIPE AND FITTINGS**

- A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.

1. NPS 3 to NPS 6: SDR 35.
2. Gaskets: ASTM F 477, elastomeric seals.

## 2.05 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
  1. Top-Loading Classification: Heavy and Extra-heavy duty.
  2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

## 2.06 MANHOLES

- A. Standard Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  1. Diameter: 48 inches (1200 mm) minimum, unless otherwise indicated.
  2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
  3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (100-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  4. Riser Sections: 4-inch (100-mm) minimum thickness, and of length to provide depth indicated.
  5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  6. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
  7. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
  8. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
  9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
  10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover.
  11. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
    - a. Material: ASTM A 48/A 48M, Class 35 gray iron, unless otherwise indicated.
- B. Cast-in-Place-Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
  1. Ballast: Increase thickness of concrete as required to prevent flotation.
  2. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
  3. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
  4. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
  5. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover.



6. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
  - a. Material: ASTM A 48/A 48M, Class 35 gray iron, unless otherwise indicated.

## **2.07 CONCRETE**

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  1. Cement: ASTM C 150, Type II.
  2. Fine Aggregate: ASTM C 33, sand.
  3. Coarse Aggregate: ASTM C 33, crushed gravel.
  4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
  1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

## **PART 3 EXECUTION**

### **3.01 EARTHWORK**

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### **3.02 PIPING APPLICATIONS**

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
    - a. Shielded flexiblecouplings for same or minor difference OD pipes.
    - b. Shielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
  2. Use pressure-type pipe couplings for force-main joints.
- B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

### **3.03 PIPING INSTALLATION**

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install cleanouts for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, nonpressure, drainage piping according to the following:
  1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
  3. Install piping with 36-inch minimum cover.
  4. Install piping below frost line.
  5. Install ductile-iron special fittings according to AWWA C600.
- F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

### **3.04 PIPE JOINT CONSTRUCTION**

- A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
  2. Join ductile-iron and special fittings according to AWWA C600 or AWWA M41.
  3. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
  4. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
  5. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

### **3.05 CONCRETE PLACEMENT**

- A. Place cast-in-place concrete according to ACI 318/318R.

### **3.06 MANHOLE INSTALLATION**

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.
- E. Form continuous concrete channels and benches between inlets and outlet.
- F. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- G. Install manhole cover inserts in frame and immediately below cover.

### **3.07 CLEANOUT INSTALLATION**

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
  2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
  3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
  4. Use extra-heavy-duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

### 3.08 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."
- B. Make connections to existing piping.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### 3.09 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
  - 1. Use warning tape or detectable warning tape over ferrous piping.
  - 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

### 3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate report for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
    - a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
    - b. Close openings in system and fill with water.
    - c. Purge air and refill with water.
    - d. Disconnect water supply.
    - e. Test and inspect joints for leaks.

- f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
- 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
  - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### **3.11 CLEANING**

- A. Clean interior of piping of dirt and superfluous material. Flush with potable water.

**END OF SECTION 22 13 13**

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PLUMBING

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. Work Included: Provide plumbing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
  - 1. Domestic hot and cold water piping system.
  - 2. Drain, waste, and vent systems.
  - 3. Gas piping system.
  - 4. Plumbing fixtures and trim as shown on the Drawings.
- B. Related Work: Documents affecting Work of this Section include, but are not necessarily limited to: General Conditions, Supplementary, and Sections in Division 1 of these Specifications.
- C. Drawings: The mechanical drawings show the general arrangement of piping, equipment, and appurtenances and shall be followed as closely as actual building construction, site conditions, and the work of other trades will permit. The mechanical work shall conform to the requirements shown on all of the drawings. General and structural drawings shall take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly.

**1.2 QUALITY ASSURANCE:**

- A. Use adequate numbers of skilled workmen 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. Codes and Regulations:
  - 1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction, all applicable laws, codes, and ordinances including those of the state, county and city.
  - 2. The Work shall also comply with all applicable requirements of the National Fire Protection Association, International Building, Plumbing and Mechanical Codes, and all locally accepted amendments to these codes.
  - 3. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern.
  - 4. Non-compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, and utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- C. Install all utility connections to water, sewer, and gas per requirements of Governing Agencies. Pay all fees and permits for inspection and certification for the execution of this Work.
  - 1. Temporary Utility Service: All required utility services such as gas, water, storm and sanitary shall be obtained and paid for by the contractor under the section of the specifications for which they are required. The general contractor shall be responsible for utilities used during construction.

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- D. Certificate of Final Inspection: Under each applicable section of the specifications, the contractor shall, upon completion of the work under that section, furnish a certificate of final inspection from the department having jurisdiction.

**1.3 EXAMINATION OF SITE:**

- A. Visit the site, inspect the existing Conditions and check the Drawings and Specifications so as to be fully informed of the requirements for completion of the Work.
- B. Lack of such information shall not justify a request for extra compensation to the contract price.

**1.4 TEMPORARY WATER SUPPLY:**

- A. Provide, where directed by the Construction Manager, two (2) 3/4" water hydrants to be used during construction. Remove from the job site upon completion of the Work.

**1.5 MATERIAL AND EQUIPMENT:**

- A. All materials and equipment shall be new, those of the same type shall be by the same Manufacturer, and shall be of the best quality and design and free from defects.
- B. A Manufacturer's nameplate affixed in a conspicuous place will be required on each major component of equipment stating Manufacturer's name, address and catalog number.
- C. Manufacturer's name and model numbers used herein and on the Drawings establish type and quality required. Equal products may be considered if submitted in writing to the Engineer/Architect for approval 10 days prior to bid date. The Contractor shall be responsible for assuring the items and equipment substituted for those shown on the Drawings will physically fit in the space allocated.
- D. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection until installed. All items subject to moisture damage (such as controls) shall be stored in dry, conditioned spaces.
- E. Protection: Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Damage or defects developing before acceptance of the work shall be made good at the contractor's expense.
- F. Dimensions: It shall be the responsibility of the contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install sizes and shapes of equipment so that the final installation shall suit the true intent and meanings of the drawings and specifications.
- G. Manufacturer's Directions: Shall be followed completely in delivery, storage, protection and installation of all equipment and materials. The contractor shall promptly give notice in writing of any conflict between any requirement of the Contract Documents and the manufacturer's directions and shall obtain written instructions before proceeding with the work. Should the

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contractor perform any work that does not comply with the manufacturer's directions or such written instructions, he shall bear all costs arising in correcting the deficiencies.

**1.6 SUBMITTALS:**

- A. Comply with pertinent provisions of Division 1.
- B. Product Data: 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, catalog cuts, and other data needed to prove compliance with the specified requirements.
  - 3. Shop Drawings and other data as required to indicate method of installing and attaching equipment, except where such details are fully shown on the Drawings.
  - 4. All sheets of the submittal shall have the job name stamped or permanently written neatly on them and shall be assembled in an indexed brochure. The descriptive material shall be arranged in the brochure in the same order as found in the specifications. Each brochure shall be submitted in a hardback, 3-ring binder. The leading sheet of the descriptive material for each item shall be full size, of heavy paper, with a numbered outside tab, and an index sheet showing the location in the brochure.
  - 5. Manufacturer's regular catalog sheets will not be acceptable under these requirements unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction, they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submittal item with its respective specified item. Special features shall be listed.
  - 6. Brochures shall contain a certification by the Contractor that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described; be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required action.
  - 7. Finding "APPROVED" or "APPROVED AS NOTED" shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called, in writing, to the proposed deviations at the time of transmittal of the brochures and such deviations have been found acceptable, nor shall it eliminate the responsibility for freedom from errors of any sort in the data submitted. Discovery of such deviations at or after installation shall be cause for immediate replacement at no additional cost to the Owner.
  - 8. No material or equipment so governed shall be ordered until found acceptable by the Architect/Engineer/Owner.
- C. Sterilization Certificate: Upon completion of water line sterilization, deliver to the Architect two copies of an acceptable "Certificate of Performance" for that activity.
- D. Record Drawings:
  - 1. Comply with pertinent provisions of Division 1.
    - a. Record Drawings- The contractor shall furnish to the owner CAD record drawings consisting of three (3) sets of 11" x 17" prints (To be bound in O&M Manuals), one (1) full size set of prints and one (1) disk, showing the piping and ductwork for the HVAC and plumbing systems. Piping sizes, rerouting, etc., for both under floor and above ceiling piping shall be shown. Also, provide a blue-line of the site plan, clearly marked, to indicate any and all changes in sanitary sewer, storm sewer,

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domestic cold water and natural gas piping to the building. In addition to these drawings, a complete set of approved ductwork shop drawings and temperature control shop drawings shall be included in this set of drawings.

- 1) CAD Record drawings shall incorporate all change and field orders. (No separate or supplemental drawings).
  - 2) All equipment schedules to be revised to reflect installed manufacturer model numbers and capabilities.
2. Include a copy of the Record Drawings in each copy of the operation and maintenance manual as described below. (Original document shall be reproducible paper.)
- E. Manuals: Upon completion of the Work of this Section, deliver to the Architect two copies of an operation and maintenance manual compiled in accordance with the provisions of Division 1 of these Specifications. Include within each manual:
1. Copy of the approved record documents for this portion of the Work.
  2. Copies of all warranties and guarantees.
  3. Description of equipment control and seasonal operation, including schedule of required maintenance.

**1.7 INSPECTION:**

- A. Make written notice to the Architect adequately in advance of each of the following stages of construction:
1. In the underground Condition prior to placing concrete floor slab, when all associated Work is in place.
  2. When all rough-in is complete, but not covered.
  3. At completion of the Work of this Section.
- B. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance, remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.

**1.8 PRODUCT HANDLING:**

- A. Comply with pertinent provisions of Division 1.

**1.9 CLEANING, TESTING AND PLACING IN SERVICE:**

- A. Immediately prior to final inspection, the Contractor shall make a final cleanup of dirt and refuse resulting from his Work and shall assist in keeping the premises clean at all times.
- B. Immediately prior to final inspection, the Contractor shall clean all material and equipment installed under this Contract. Dirt, dust, plaster, stains and foreign matter shall be removed from all surfaces. Damaged finishes shall be touched up and restored to their original Condition.
- C. Mechanism of all equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required to produce the intended performance.



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**1.10 ADJUSTMENT AND INSTRUCTION:**

- A. Energize all systems, equipment and fixtures and check for proper operation.
- B. The Contractor's service personnel shall instruct the Owner's Representative in the proper operation of all systems.

**1.11 GUARANTEE:**

- A. The Contractor guarantees all Work against any defects due to faulty workmanship or material and that all raceways, ducts, and piping are free from foreign material, obstructions, holes, or breaks of any nature.
- B. Upon written notice from the Architect or Owner, the Contractor shall promptly remedy without cost to the Owner any defects occurring within a period of one (1) year from the date of final acceptance.

**1.12 WARRANTY:**

- A. The Contractor shall properly execute in the Owner's name all Manufacturer's standard warranty certificates applying to equipment installed on the project and shall deliver said certificates to the Architect at completion of the job. All warranty cards shall also be properly executed and delivered to the supplier or Manufacturer's records. Standard warranties for equipment shall not be less than one (1) year.

**PART 2 - PRODUCTS**

**2.1 PIPE SCHEDULE:**

- A. Drain, Waste, and Vent System:
  - 1. For sanitary Work below the floor and outside underground:
    - a. Provide service weight cast iron pipe and fittings or Schedule 40 PVC DWV pipe if allowed by local codes.
    - b. Soil lines 5'-0" or more away from the structures may be Schedule 40 PVC.
  - 2. Above ground:
    - a. Provide service weight cast iron pipe and fittings with No-Hub joints. Schedule 40 PVC DWV pipe may be used in lieu of cast iron if allowed by local codes. All above ground rain water piping shall be cast iron and insulated.
- B. Water System (domestic piping):
  - 1. Above ground, provide Type "L" copper with sweated connections.
  - 2. Below grade, provide Type "K" copper with sil-fossed connections. Schedule 40 PVC may be used for water service, if allowed by local codes.
- C. Gas Piping:
  - 1. Underground piping equal to Republic X-Tru-Coat plastic coated black steel pipe with protective wrap over joints.
    - a. Piping 2" and smaller: Threaded fittings.
    - b. Piping 2-1/2" and larger: Welding fittings.

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2. Above ground piping shall be black steel.
3. Gas service piping up to the building shall be continuous plastic pipe meeting ASTM D2513 and D2517.

**2.2 MATERIALS:**

- A. Cast Iron Soil Pipe and Fittings:
  1. Provide service weight cast iron conforming to ASTM A74 and CISPI 301, or provide hubless type per above standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
- B. Galvanized:
  1. Provide standard weight complying with ASTM A53 and A120 for above ground piping. (Galvanized not allowed underground or under slab floors.)
- C. Copper Pipe:
  1. Provide copper pipe conforming to ASTM B42 and B302. (Type "M" copper not allowed underground or under slab floors.)
- D. Copper Tube:
  1. Provide copper tube conforming to ASTM B75, B88, and B251. (Type "M" copper not allowed underground or under slab.)
- E. Polyvinyl Chloride Pipe:
  1. Provide PVC pipe conforming to ASTM D2665 for waste, vent, and drainage pipe above and underground within 5'-0" of the building.
  2. Provide PVC pipe conforming to ASTM D2265 for building sewer pipe.
  3. Provide PVC pipe conforming to ASTM D1785 for water service pipe.
- F. Black Steel Pipe:
  1. Provide black steel pipe conforming to ASTM A53 and A120.
- G. Fittings:
  1. 2" and smaller provide standard cast iron threaded fittings.
  2. 2-1/2" and larger provide standard Butt Welding fittings.
- H. Unions:
  1. For copper lines, provide copper unions.
  2. For connections in iron pipe lines:
    - a. 2" and smaller provide ground joint brass-to-iron fittings.
    - b. 2-1/2" and larger provide standard cast iron with flanged ends and gaskets.

**2.3 VALVES:**

- A. All valves of the same type shall be by the same Manufacturer.
- B. Gate Valves: Provide solid wedge disc, rising stem, 200# WOG; non-rising stem valves may be used only where there is insufficient clearance. Sweat joint valves shall be used on all copper pipes.
  1. 2" and smaller, rising stem: Provide Hammond #IB-640, bronze, screwed, B-62 bronze body and stem, malleable iron handwheel.

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2. 2" and smaller, non-rising stem: Provide Hammond IB-645, bronze, screwed, B-62 bronze body and stem, malleable iron handwheel.
  3. 2-1/2" and larger: Provide Hammond #IR-1140, IBBM, flanged, non-rising stem.
- C. Globe Valves: Provide replaceable composition disc suitable for 200°F water.
1. 2" and smaller: Provide Hammond #IB-413T, bronze, screwed, malleable iron hand wheel.
  2. 2-1/2" and larger: Provide Hammond #IR-116, iron body, flanged, 200# WOG.
- D. Ball Valves: Provide large port ball of chrome plated, bronze or stainless steel construction, screwed ends, quarter turn operation, lever or C-handle operator. Valve shall be rated for 150 psi steam, 600 psi WOG. Valve shall have blow out proof stem and adjustable packing nut.
1. 2" and smaller: Hammond #8501 Series or approved equal.
- E. Gas Cocks:
1. 2" and smaller: Provide bronze, screwed, lubricated square head valve equal to Resun #R-1430.
  2. 2-1/2" and larger: Provide Nordstrom #142 or #143.
- F. Check Valves:
1. 2" and smaller: Provide Hammond #IB-940, bronze, screwed, Y-pattern, 200# WOG, swing check type.
  2. 2-1/2" and larger: Provide Hammond #IR-1124, IBBM, flanged, 200# WOG.
- G. Strainers: Provide Y-pattern, 200# WOG, 20 mesh stainless perforated screen free area, equal to 4 times pipe area.
1. 2" and smaller: Provide Wilkins #YSBR Series, screwed.
  2. 2-1/2" and larger: Provide Wilkins #FS Series, flanged.
- H. Plumbing Fixture Service Valves:
1. 1/2" angle valve with wheel handle stop, 1/2" I.P.S. female inlet, 3/8" tube compression fitting outlet, 3/8" chrome plated flexible riser and chrome plated escutcheon plate. Chicago Faucet #1015 or equal.

**2.4 FLASHING:**

- A. Where pipes of this Section pass through the roof, flash with Semco, #1100-4 seamless 4 lb. flashing, with steel reinforced "Vari-Pitch" boot and cast iron counterflashing sleeve or equal method approved by the Architect.

**2.5 PIPE HANGERS:**

- A. Water Piping:
1. Provide Fee and Mason #212 split ring hangers with supporting rods.
  2. Copper plated hangers or hangers with dielectric isolators to be installed for copper pipe.
- B. Soil and Waste Piping:
1. Provide Fee and Mason #212 adjustable ring hangers with supporting rods.
  2. Use Fee and Mason #241 riser clamps at each floor and as required.
- C. Gas Piping:

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1. Provide Fee and Mason #241 split ring hangers with supporting rods.

**2.6 CLEANOUTS:**

- A. Exterior:
  1. Provide Wade W-6030-Z, or Smith #4253 with XH cast iron top in concrete areas.
- B. Floors:
  1. Provide Wade W-6030-1 or Smith #4023 with round nickle bronze top in finished room floors.
  2. Provide Wade W-6030-Z or Smith #4223 with round cast iron top in unfinished room floors.
  3. Provide "flush-with-floor" type cleanouts, with adjustable watertight covers and integral anchoring flange with clamping collar where waterproofing membrane is used.
- C. Finished Walls:
  1. Provide Wade W-8460-R6 or Smith #4532 with round chrome plate or stainless steel access plate and screw.
- D. Provide cleanout plugs of extra heavy bronze.

**2.7 ACCESS BOXES:**

- A. Walls:
  1. Provide Wade W-8480-ST or Smith #4730 with polished chrome plate face in tile walls.
  2. Provide Wade W-8490-AKL, Smith #4760-AKL or #4765-AKL with bonderized prime-coated steel face and with Allen locks in walls of other finished rooms.
- B. Ceilings:
  1. Provide Acorn DW Series bonderized prime-coated steel face with Allen lock.

**2.8 TRAPS:**

- A. For lavatories and sinks, except service sinks, provide chrome plated cast brass traps with brass nuts. Provide deep seal traps where required and/or shown on the Drawings.
- B. For handicap lavatories, provide off-set tailpiece ahead of P-trap.

**2.9 WATER HAMMER ARRESTORS:**

- A. Provide Smith #5000 series or Precision Plumbing Products, Inc. stainless steel.

**2.10 INSULATION:**

- A. Insulate hot water, cold water, and condensate piping with 1/2" thick glass fiber preformed pipe insulation with factory applied all purpose glass fiber reinforced flame retardant kraft paper and aluminum foil self sealing lap.

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- B. Elbows and fittings to be insulated with factory preformed PVC jacketed insulation material to match thickness of pipe insulation.
- C. Valve bodies shall be insulated with Armstrong Armaflex type "FR" or equal insulation with vapor barrier. Factory preformed insulation enclosures may be substituted for field applied insulation.
- D. Insulated waste traps receiving cooling coil condensate and piping for a minimum of 10 feet after trap with ½ inch Armstrong Armaflex type "FR" or equal insulation with vapor barrier.
- E. Where shown on the Drawings or required by governmental agencies having jurisdiction, at lavatories for handicapped persons provide TRUEBRO Inc. Handi Lav-Guard model #102W and #105W white finish insulation on hot water supply, cold water supply, tailpiece, and trap or equal approved manufacturer.

**2.11 FIXTURES AND EQUIPMENT:**

- A. Provide plumbing fixture, trim, (exposed trim to be chrome plated) and equipment as shown on the "Plumbing Fixture Schedule" in the Drawings. China fixture shall be of the best grade vitreous ware without pit holes and blemishes. The Architect reserves the right to reject any pieces which, in his opinion, are faulty.
  - 1. For the purpose of identification only one Manufacturer's model numbers are used throughout the schedule shown on the Drawings.
  - 2. Approved Manufacturers: American Standard, Crane, Kohler, or Eljer.
- B. Non-Freeze Hose Bibbs (FPHB):
  - 1. Provide 3/4" non-freeze type of cast bronze construction with lock shield cap and loose key operator to suit wall size.
  - 2. Hose bibb to have integral backflow preventer, pressure relief valve and vacuum breaker.
  - 3. Approved equal by Wade (W-8620), Zurn or Woodford.
- C. Cover Plates (Escutcheons):
  - 1. Provide chrome plated brass equal to Beaton Corbin Company style 2-BC for copper tube and 13-BC for standard pipe.
- D. Floor Drains:
  - 1. Provide floor drains where indicated on the Drawings complete with deep seal P-trap as listed below for various floor conditions:
    - a. Linoleum or asphalt tile floor - Wade W-1100-STD-1 with nickle bronze raised lip strainer.
    - b. Quarry tile or Terrazzo floor - Wade W-1100-G-1 with nickle bronze square strainer.
    - c. General - Wade W-1100 with type B nickle bronze strainer:
      - 1) 2" drain to have 5" strainer;
      - 2) 3" drain to have 6" strainer;
      - 3) 4" drain to have 8" strainer.
    - d. Heavy duty - Wade W-1200-13-5 with 12" diameter secured coated iron grate.
    - e. Manufacturers - Zurn, Wade, or J.R. Smith.

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**2.12 SLEEVES:**

- A. Where pipes pass through concrete, masonry, or stud walls, or pass through ceilings, provide 20-gauge galvanized sheet metal sleeve large enough to allow for free movement of the pipes with expansion.

**2.13 WATER HEATER (ELECTRIC):**

- A. Provide A.O. Smith series ELJF domestic electric water heater sized as noted on the Drawings or of approved equal by P.V.I., Crane, National, State or approved equal.
- B. Water heater features to include glass lining bonded to heavy steel tank; tank constructed and guaranteed to 150 psi working pressure, screw-in type direct immersion heating elements, magnesium anode, factory insulated, cold rolled steel jacket with baked enamel finish, thermostat, 1 year commercial warranty.
- C. Provide Watts XL Series pressure/temperature relief valve with AGA label.

**2.14 OTHER MATERIALS:**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

**PART 3 - EXECUTION**

**3.1 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.

**3.2 PLUMBING SYSTEM LAYOUT:**

- A. Lay out the plumbing system in careful coordination with the Drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system.
- B. Follow the general layout shown on the Drawings in all cases except where other Work may interfere.
- C. Lay out pipes to fall within partition, wall, or roof cavities, and do not require furring other than as shown on the Drawings. Do not install domestic water lines in exterior walls without proper considerations of required insulation and routing.
- D. Slots, Chases, Openings, and Recesses: Through floors, walls, ceilings, and roofs as specified in new structure will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located and shall do any cutting and patching

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caused by the neglect to do so. No cuts shall be made into any structural element, beam or column, without written approval. Opening in existing structures will be provided by the trade requiring same.

- E. Locations: Of pipes, ducts, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The contractor shall determine the exact route and location of each pipe, duct and electrical raceway prior to fabrication.
  - 1. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, plumbing drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
  - 2. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The contractor shall furnish and install all traps and sanitary vents, etc., as required to effect these offsets, transitions and changes in direction.

**3.3 TRENCHING AND BACKFILLING:**

- A. Perform trenching and backfilling associated with the Work of this Section in strict accordance with the provisions of Division 2 of these Specifications.
- B. Cut bottom of trenches to grade. Make trenches 12" wider than the greatest dimension of the pipe.
- C. Bedding and Backfilling:
  - 1. Install piping promptly after trenching. Keep trenches open as short a time as practicable.
  - 2. Under the building, install pipes on a 6" bed of damp sand. Backfill to bottom of slab with damp sand.
  - 3. Outside the building, install underground piping on a 6" bed of damp sand. Backfill to within 12" of finish grade with damp sand. Backfill remainder with native soil.
  - 4. Do not backfill until installation has been approved and Project Record Documents have been properly annotated.
  - 5. Provide bare copper trace wire 6 inches above all buried plastic pipe.
  - 6. Provide continuous plastic banner labeled CAUTION-GAS PIPING 12 inches above all buried gas piping.

**3.4 INSTALLATION OF PIPING AND EQUIPMENT, GENERAL:**

- A. General:
  - 1. Proceed as rapidly as the building construction will permit. Install piping parallel and perpendicular to building walls and partitions.
  - 2. Thoroughly clean items before installation. Cap pipe openings to exclude dirt until fixtures are installed and final connections have been made.
  - 3. Cut pipe accurately, and work into place without springing or forcing, properly clearing windows, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.
  - 4. Show no tool marks or threads on the exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.

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5. Make changes in directions with fittings; make changes in main size with eccentric reducing fittings. Unless otherwise noted, install water supply and return piping with straight side of eccentric fittings at top of the pipe.
  6. Run horizontal sanitary piping at a uniform grade of 1/4" per ft., unless otherwise noted. Branch connections and changes in direction to be made with 45 degree "Y" fittings or long sweep ells.
  7. Run horizontal water piping with an adequate pitch upward in direction of flow to allow complete drainage.
  8. Install vent connections on all fixtures, traps, and equipment connected to the soil and waste system and extend not less than 3'-6" above floor before turning horizontal. Extend vent through roof minimum 1'-0" above roof or adjacent wall within 18" of roof penetration.
  9. Provide sufficient swing joint, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings. Make branch connections with offsets to provide for pipe movement.
  10. Support piping independently at pumps, coils, tanks, and similar locations, so that weight of pipe will not be supported by the equipment.
  11. Pipe drain lines from drip pans, air vents, relief valves and similar locations, to spill over an open sight drain, floor drain, or other acceptable discharge point, and terminate with a plain end, unthreaded pipe 2" above the drain.
  12. Securely bolt all equipment, isolators, hangers, and similar items in place.
  13. Support each item independently from other pipes. Do not use wire for hanging or strapping pipes.
  14. Provide complete dielectric isolators between ferrous and non-ferrous metals.
  15. Provide union and shut-off valves suitably located to facilitate maintenance and removal of equipment and apparatus.
  16. Provide shut-off gas valve and union at each piece of gas fired equipment and service penetration through exterior wall and roof.
  17. Valves, strainers, check valves, and fittings shall be full size of the line they serve unless noted otherwise.
  18. Make change in pipe size noted on the plans after last fitting of larger pipe. When supply pipes are larger than equipment tapings, reduce size immediately prior to entry.
- B. Equipment Access:
1. Install piping, equipment, and accessories to permit access for maintenance. Reroute pipe and/or relocate items as necessary to provide such access, and without additional cost to the Owner.
  2. Provide access doors where valves, motors, or equipment requiring access for maintenance are located in walls or chases or above ceilings. Coordinate location of access doors with other trades as required.

**3.5 PIPE JOINTS:**

- A. Copper Tubing:
1. Cut square, remove burrs, and clean inside of female fitting to a bright finish.
    - a. Apply solder flux with brush to tubing.
    - b. Remove internal parts of solder-end valves prior to soldering.
  2. Provide dielectric unions at points of connection of copper tubing to ferrous piping and equipment.
  3. For joining copper tubing, use:
    - a. Water piping 3" and smaller : 95-5 solder, non lead bearing.
    - b. Water piping larger than 3" : "Sil-fos" brazing.



c. Underground : "Sil-fos" brazing.

- ### 3.6 PIPE SUPPORTS:

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- E. Space hangers and supports for horizontal PVC plastic pipe 4'-0" on center.
- F. Provide sway bracing on hangers longer than 18".
- G. Support vertical piping with riser clamps secured to the piping and resting on the building structure. Provide at each floor unless otherwise noted.
- H. Provide insulation continuous through hangers and rollers. Protect insulation by galvanized steel shields.
- I. Arrange pipe supports to prevent excessive deflection, and to avoid excessive bending stress.
- J. Support piping from inserts or anchors in concrete slabs. Provide the inserts under this Section and arrange for the placing under Section 03300 of these Specifications. Use expansions inserts only where approved by the Architect.
- K. Hubless Piping:
  - 1. Provide hangers on the piping at each side of, and within 6" of, hubless pipe coupling so the coupling will bear no weight.
  - 2. Do not provide hangers on couplings.
  - 3. Provide hangers adequate to maintain alignment and to prevent sagging of the pipe.
  - 4. Make adequate provisions to prevent shearing and twisting of the pipe and the joint.

**3.7 SLEEVES AND OPENINGS:**

- A. Provide sleeves for each pipe passing through walls, partitions, floors, roofs, and ceilings.
  - 1. Set pipe sleeves in place before concrete is poured.
  - 2. For uninsulated pipe, provide sleeves two pipe sizes larger than the pipe passing through, or provide a minimum of 1/2" clearance between inside and outside of the pipe.
  - 3. For insulated pipe, provide sleeves of adequate size to accommodate the full thickness of pipe covering, with clearance of packing and caulking.
- B. Caulk the space between sleeve and pipe or pipe covering, using a noncombustible, permanently plastic, waterproof, non-staining compound which leaves a smooth finished appearance, or pack with noncombustible cotton, rope, or fiberglass to within 1/2" of both wall faces, and provide the waterproof compound described above.
- C. Finish and Escutcheons:
  - 1. Smooth any rough edges around sleeves with plaster or spackling compound.
  - 2. Provide 1" wide chrome or nickle plated escutcheons in all pipes exposed to view where passing through walls, floors, partitions, ceilings, and similar locations.
    - a. Size the escutcheons to fit pipe and covering.
    - b. Hold escutcheons in place with set screw.

**3.8 CLEANOUTS:**

- A. Accessible cleanouts shall be installed in all horizontal waste lines at no greater than 100 ft. intervals and at the base of all vertical stacks.
- B. Secure the Architect's approval of locations for cleanouts in finished areas prior to installation.

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- C. Provide cleanouts of same nominal size as the pipes they serve; except where cleanouts are required in pipes 4" and larger, provide 4" cleanouts.
- D. Make cleanouts accessible. After pressure tests are made and approved, thoroughly graphite the cleanout threads.

**3.9 VALVES:**

- A. Provide valves in water and gas systems. Locate and arrange so as to give complete regulation of apparatus, equipment, and fixtures.
- B. Provide valves in at least the following locations:
  - 1. In branches and/or headers of water piping serving a group of fixtures.
  - 2. On both sides of apparatus and equipment.
  - 3. For shutoff of risers and branch mains.
  - 4. For flushing and sterilizing the system.
  - 5. Where shown on the Drawings.
- C. Locate valves for easy accessibility and maintenance.

**3.10 WATER HAMMER ARRESTORS:**

- A. Provide water hammer arrestors on hot water lines and cold water lines.
  - 1. Install in upright position at all quick closing valves, solenoids, isolated plumbing fixtures, and supply headers at plumbing fixture groups.
  - 2. Locate and size as specified or as shown on the Drawings and, where not shown, locate in accordance with Plumbing and Drainage Institute Standard WH-201.
  - 3. Install water hammer arrestors behind access panels.
- B. Where fixtures are not protected by water hammer arrestors, provide air compression chambers equal to twelve (12) pipe diameters, 18" minimum on all water supply connections.

**3.11 BACKFLOW PREVENTION:**

- A. Protect plumbing fixtures, faucets with hose connections, yard hydrants, lawn irrigation, and other equipment having plumbing connection, against possible back-siphonage.

**3.12 PLUMBING FIXTURE INSTALLATION:**

- A. Installation:
  - 1. Set fixtures level and in proper alignment with respect to walls and floors, and with fixtures equally spaced.
  - 2. Provide supplies in proper alignment with fixtures and with each other.
  - 3. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets.
  - 4. Install all fixture supports before wall finish is applied.
- B. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.

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- C. Caulk deck-mounted trim at the time of assembly, including fixture and casework mountings. Caulk self-rimming sinks installed in casework.
- D. All fixtures shall be cleaned before setting and the installation shall be left ready for use.

**3.13 WATER HEATER:**

- A. Installation:
  - 1. Set tank level with proper clearances and arranged for easy access for lighting pilot, adjustment of controls, and shut-off valves.
  - 2. Provide shut-off valves and dielectric unions on both hot water and cold water lines.
  - 3. Provide relief line from pressure and temperature relief valve to nearest floor drain, or approved receptor.
  - 4. Install all auxiliary equipment such as thermometers, gauges, circulating pumps, temperature control valves, etc., as noted on the Drawings.

**3.14 DISINFECTION OF WATER SYSTEMS:**

- A. Sterilize domestic hot and cold water systems to meet Health Department requirements.
  - 1. Prior to treatment, flush the system of all dirt and foreign matter.
  - 2. Fill system with water treated with 50 ppm of chlorine. Leave treated water in the systems for 24 hours.
  - 3. Open all valves and faucets several times during flushing and treatment filling to insure full circulation.
  - 4. Test the chlorine content at the end of treatment period and if chlorine content is greater than 10 ppm, flush the system. If chlorine content is found to be less than 10 ppm, repeat the sterilization process. Take samples from several points in the system.
  - 5. After sterilization, flush the system with clean water until the chlorine is less than 0.1 ppm.
- B. After final flushing, obtain Health Department Certificate of Approval on samples of water taken from the systems. (Use a testing agency approved by the Health Department.) Test shall show negative for coli-aerosene organisms.
- C. If analysis results are not satisfactory, repeat the disinfection procedures and retest until specified standards are achieved.

**3.15 OTHER TESTING AND ADJUSTING:**

- A. Provide personnel and equipment, and arrange for and pay the costs of, all required tests and inspections required by governmental agencies having jurisdiction.
- B. Test the following systems at the pressures listed:
  - 1. Gas piping: Test under 30 psi air pressure.
  - 2. Domestic water: Test under 130 psi hydrostatic pressure.
  - 3. Soil and waste:
    - a. Above ground test with 12 ft. water head;
    - b. Underground test with 8 ft. water head.

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- C. Where tests show materials or workmanship to be deficient, replace or repair as necessary, and repeat the tests until the specified standards are achieved.
- D. Adjust the piping systems to optimum standards of operation.

**3.16 SERVICE CONNECTIONS TO UTILITIES:**

- A. Water: Install service lines, shut off valves, unions, meter, and service box in accordance with requirements of the Water Department. When static pressure exceeds 80 psi, furnish and install variable setting pressure reducing valve (25 to 75 lbs.) at meter.
- B. Sanitary Sewer: Install tie-in to public sanitary sewer main using the type and method of connection in accordance with requirements of the Sewer Department. Verify inverts prior to building rough-in.
- C. Gas: Install rough-in piping, insulating union, and shut-off valve in accordance with requirements of the Gas Company.

**END OF SECTION**

SECTION 230600  
HEATING, VENTILATION, AND AIR CONDITIONING

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. Work Included: Provide heating, ventilating, and air conditioning systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Mini-Split system direct expansion heat pump heating and cooling system with controls, safety controls, blowers, motors, compressors, coils, filters, and related items.
  2. Split system direct-expansion cooling, gas-fired heating system with control, safety controls, blowers, motors, air cooled condensers, compressors, filters, refrigerant piping and related items
  3. Air conditioning supply and return ductwork system with grilles, diffusers, registers, dampers, sheet metal hardware, and related items.
  4. Exhaust systems including, motors, ductwork, grilles, registers, controls and related items.
  5. Temperature control system.
  6. Air systems balance for air quantities shown on the plans.
  7. Acoustical and thermal insulation of ducts, piping, and equipment.
- B. Related Work: Documents affecting Work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of this Specification.
- C. Drawings: The mechanical drawings show the general arrangement of all piping, equipment, and appurtenances and shall be followed as closely as actual building construction, site conditions, and the work of other trades will permit. The mechanical work shall conform to the requirements shown on all of the drawings. General and structural drawings shall take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly.

**1.2 QUALITY ASSURANCE:**

- A. Use adequate numbers of skilled workmen 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. Codes and Regulations:
1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction, all applicable laws, codes, ordinances including those of the state, county and city.
  2. The Work shall also comply with all applicable requirements of the National Fire Protection Association, International Building, Plumbing and Mechanical codes, and all locally accepted amendments to these codes.

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3. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern.
  4. Pay all fees, taxes, licenses and permits for inspection and certification for the execution of this Work.
  5. Non-compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, and utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- C. Certificate of Final Inspection: Under each applicable section of the specifications, the contractor shall, upon completion of the work under that section, furnish a certificate of final inspection from the department having jurisdiction.

**1.3 EXAMINATION OF SITE:**

- A. Visit the site, inspect the existing Conditions and check the Drawings and Specifications so as to be fully informed of the requirements for completion of the Work.
- B. Lack of such information shall not justify a request for extra compensation to the contract price.

**1.4 MATERIAL AND EQUIPMENT:**

- A. All materials and equipment shall be new, of the same type and Manufacturer, and shall be of the best quality and design and free from defects.
- B. A Manufacturer's nameplate affixed in a conspicuous place will be required on each major component of equipment stating Manufacturer's name, address and catalog number.
- C. Manufacturer's name and model number used herein and on the Drawings establish type and quality required. Equal products may be considered if submitted in writing to the Engineer/Architect for approval 10 days prior to bid date. The Contractor shall be responsible for assuring the items and equipment substituted for those shown on the Drawings will physically fit in the space allocated.
- D. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection until installed. All items subject to moisture damage (such as controls) shall be stored in dry, conditioned spaces.
- E. Protection: Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Damage or defects developing before acceptance of the work shall be made good at the contractor's expense.
- F. Dimensions: It shall be the responsibility of the contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install sizes and shapes of

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equipment so that the final installation shall suit the true intent and meanings of the drawings and specifications.

- G. Manufacturer's Directions: Shall be followed completely in delivery, storage, protection and installation of all equipment and materials. The contractor shall promptly give notice in writing of any conflict between any requirement of the Contract Documents and the manufacturer's directions and shall obtain written instructions before proceeding with the work. Should the contractor perform any work that does not comply with the manufacturer's directions or such written instructions, he shall bear all costs arising in correcting the deficiencies.

**1.5 SUBMITTALS:**

- A. Comply with pertinent provisions of Division 1.
- B. Product Data: Within 35 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, catalog cuts, and other data needed to prove compliance with the specified requirements.
  3. Shop Drawings and other data as required to indicate method of installing and attaching equipment, except where such details are fully shown on the Drawings.
  4. All sheets of the submittal shall have the job name stamped or permanently written neatly on them and shall be assembled in an indexed brochure. The descriptive material shall be arranged in the brochure in the same order as found in the specifications. Each brochure shall be submitted in a hardback, 3-ring binder. The leading sheet of the descriptive material for each item shall be full size, of heavy paper, with a numbered outside tab, and an index sheet showing the location in the brochure.
  5. Manufacturer's regular catalog sheets will not be acceptable under these requirements unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction, they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submittal item with its respective specified item. Special features shall be listed .
  6. Brochures shall contain a certification by the Contractor that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described; be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required action.
  7. Finding "APPROVED EQUAL" or "NO EXCEPTION TAKEN" shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called, in writing, to the proposed deviations at the time of transmittal of the brochures and such deviations have been found acceptable, nor shall it eliminate the responsibility for freedom from errors of any sort in the data submitted. Discovery of such deviations at or after installation shall be cause for immediate replacement at no additional cost to the Owner.
  8. No material or equipment so governed shall be ordered until found acceptable by the Architect/Engineer/Owner.
- C. Record Drawings:
1. Comply with pertinent provisions of Division 1.

February 9, 2023  
Will Rogers Stadium Visitor's Addition  
Tulsa Public Schools

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HVAC

Allied Engineering Group, LLC  
Tulsa, OK,



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- a. Record Drawings- The contractor shall furnish to the owner CAD record drawings consisting of three (3) sets of 11" x 17" prints (To be bound in O&M Manuals), one (1) full size set of prints and one (1) disk, showing the piping and ductwork for the HVAC and plumbing systems. Piping sizes, rerouting, etc., for both under floor and above ceiling piping shall be shown. Also, provide a blue-line of the site plan, clearly marked, to indicate any and all changes in sanitary sewer, storm sewer, domestic cold water and natural gas piping to the building. In addition to these drawings, a complete set of approved ductwork shop drawings and temperature control shop drawings shall be included in this set of drawings.
    - 1) CAD Record drawings shall incorporate all change and field orders. (No separate or supplemental drawings).
    - 2) All equipment schedules to be revised to reflect installed manufacturer model numbers and capabilities.
  - 2. Include a copy of the Record Drawings in each copy of the operation and maintenance manual described below. (Original document shall be reproducible paper.)
- D. Manuals: Upon completion of this portion of the Work, and as a Condition of its acceptance, deliver to the Architect two copies of an operation and maintenance manual compiled in accordance with the provisions of Division 1 of these Specifications. Include within each manual:
- 1. Copy of the approved record documents for this portion of the Work.
  - 2. Copies of all warranties and guarantees.
  - 3. Description of HVAC equipment control and seasonal operation, including schedule of required maintenance.

**1.6 PRODUCT HANDLING:**

- A. Comply with pertinent provisions of Division 1.

**1.7 INSPECTION:**

- A. Make written notice to the Architect adequately in advance of each of the following stages of construction:
  - 1. In the underground condition prior to placing concrete floor slab, when all associated Work is in place.
  - 2. When all rough-in is complete, but not covered.
  - 3. At completion of the Work of this Section.
- B. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance, remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.

**1.8 CLEANING, TESTING AND PLACING IN SERVICE:**

- A. Immediately prior to final inspection, the Contractor shall make a final cleanup of dirt and refuse resulting from his Work and shall assist in keeping the premises clean at all times.

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- B. Immediately prior to final inspection, the Contractor shall clean all material and equipment installed under this Contract. Dirt, dust, plaster, stains and foreign matter shall be removed from all surfaces. Damaged finishes shall be touched up and restored to their original Condition.
- C. Mechanism of all equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required to produce the intended performance.

**1.9 ADJUSTMENT AND INSTRUCTION:**

- A. Energize all systems, equipment and fixtures and check for proper operation. Mechanical contractor shall prove all HVAC systems operate as designed in cooling and heating modes with required outdoor air settings prior to turning over equipment to Owner for installation of controls.
- B. HVAC system shall be placed in operation and balanced to provide air flow as indicated on the Drawings.
- C. The Contractor's service personnel shall instruct the Owner's Representative in the proper operation of all systems.

**1.10 GUARANTEE:**

- A. The Contractor guarantees all work against any defects due to faulty workmanship or material and that all raceways, ducts and piping are free from foreign material, obstructions, holes or breaks of any nature.
- B. Upon written notice from the Architect or Owner, the Contractor shall promptly remedy without cost to the Owner any defects occurring within a period of one (1) year from the date of final acceptance.

**1.11 WARRANTY:**

- A. The Contractor shall properly execute in the Owner's name all Manufacturer's standard warranty certificates applying to equipment installed on the project and shall deliver said certificates to the Architect at completion of the job. All warranty cards shall also be properly executed and delivered to the supplier or Manufacturer's representative for Manufacturer's records. Standard warranties for equipment shall not be less than one (1) year.

**PART 2 - PRODUCTS**

**2.1 SHEET METAL DUCTWORK:**

- A. For interior heating, ventilating, and air conditioning systems, provide best grade, prime, open hearth, galvanized sheet metal ducts fabricated and installed to pertinent ASHRAE and

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SMACNA standards, or to the requirements of governmental agencies having jurisdiction, whichever requirement is more stringent.

- B. Round ductwork to be constructed of best grade prime, open hearth galvanized steel with spiral seams. For systems with less than .75" W.G. pressure, round duct with longitudinal snap lock seams and beaded sleeve transverse joints may be installed.

**2.2 FLEXIBLE DUCT:**

- A. Provide factory fabricated insulated low pressure flexible duct with the following attributes as manufactured by Thermaflex, Wire Mold, Metaflex, or Flexmaster.
  - 1. Helix wire flexible core.
  - 2. 2" fiberglass blanket insulation of 3/4 lb. density with continuous sealed vapor barrier jacket.
  - 3. Accessories shall include strap clamps, spin-in duct taps, air scoops and dampers as required.
  - 4. Composite assembly, including insulation and vapor barrier, shall meet all requirements of UL 181, including flame spread of 25 or less and smoke developed rating of 50 or less as set forth in NFPA Bulletin 90-A, and bearing UL label as a Class 1 air duct.

**2.3 FABRIC DUCTWORK:**

- A. Provide fabric air diffuser constructed of a woven fire retardant fabric with the following characteristics:
  - 1. Minimum 10 year warranty.
  - 2. 100% flame retardant.
  - 3. 8.20 oz/sq yd. per ASTM D3776.
  - 4. Air Permeability: 2 cfm per sf per ASTM D737 at 0.5 static pressure.
  - 5. Minimum "high" operating temperature 176 deg. F.
  - 6. 1 inch holes spaced per manufacturer's recommendations for the dispersion of the total design CFM in single or multiple rows for the length of the duct at the angles noted on the drawings.
  - 7. Single or parallel stainless steel cable support or track type support. Means and methods of support anchors and attachments to be coordinated with building conditions of construction.
  - 8. Color selected by the Architect.

**2.4 DUCTWORK FABRICATION:**

- A. All interior ductwork and fittings shall be fabricated in accordance with recommendations as outlined in current ASHRAE and SMACNA Standards.
- B. Gauges and reinforcing in accordance with current SMACNA Standards for greatest dimensions of duct or housing.
- C. Lap metal ducts in direction of air flow. Hammer down edges and slip joints to leave smooth duct interior.

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- D. Cross break all rectangular ducts 18" and larger. Omit cross breaking if two gauge heavier metal is used in duct construction.
- E. Transverse Joints: Ductwork up to 24", use s-drive, pocket, or bar slip. Ductwork 25" to 40", use joints forming outside ribs. Other joint connections of equivalent mechanical strength and air tightness may be used if approved by the Engineer.
- F. Construct elbows with radius of not less than 1-1/2 times width of duct on center line or square elbows with air foil turning vanes. Round duct elbows shall be of the smooth radius type. For round duct systems with less than .75" W.G. pressure, jointed elbows may be installed.
- G. Branch ducts shall be tied to main trunk duct through radius take-off and splitter damper, or 45 degree branch and curved blade extractor. Round branch duct tappings to be of the conical or spin-in type with air scoop and volume damper for supply air on 12" round and smaller. Flanged or bellmouth taps used for larger ducts as noted on the Drawings.
- H. Transitions shall be constructed per SMACNA Standards and shall not exceed 20 degrees for diverging air flows or 30 degrees for contracting air flows.
- I. Plenums shall be fabricated in accordance to duct gauges and shall be reinforced per SMACNA standards.
- J. Exterior duct joints to be hard cast and sealed water tight.

**2.5 DUCT HANGERS AND SUPPORTS:**

- A. Hangers shall be galvanized steel band iron or angle iron and galvanized threaded rod. Wall supports shall be galvanized steel band iron or fabricated angle bracket.

**2.6 DUCT INSULATION:**

- A. General:
  - 1. Provide materials complying with NFPA Bulletin 90-A, as determined by UL method NFPA 225-ASTM E84, and complying with the governing code, with flame spread rating less than 25 and smoke developed rating less than 50.
  - 2. Where vapor barriers are used, provide intact and continuous throughout with all joints sealed.
  - 3. Manufacturer of duct liners shall print density and thickness on face of duct liner.
  - 4. Acceptable Manufacturers:
    - a. Owens/Corning Fiberglass
    - b. Johns-Manville
    - c. Certainteed
    - d. Armstrong
- B. Ductliner (Interior Rectangular Duct): Insulate internal supply, return and exhaust ducts with 1" glass fiber with a minimum density of 1.5 pounds per cubic foot. Liner to be coated to prevent fiber erosion at air velocities up to 4000 f.p.m.

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- C. Ductwrap (Round Duct): Insulate externally all round ducts and fresh air ducts with 2" thick, 1 pound density, fiberglass ductwrap with factory applied reinforced aluminum foil vapor barrier.
- D. Exterior Duct Liner: All ductwork exposed to weather to be internally insulated with 2" glass fiber with a minimum density of 3.0 pounds per cubic foot. Liner to be coated to prevent fiber erosion at air velocities up to 4000 f.p.m.

**2.7 DUCTWORK ACCESSORIES:**

- A. Acceptable Manufacturers:
  - 1. Air Balance, Inc.
  - 2. Ruskin
  - 3. Carnes
  - 4. Pottorff
  - 5. Krueger
  - 6. United Enertech
  - 7. Nailor Industries
- B. Access Doors: Access doors shall be installed for inspection, service, and maintenance of balance dampers, fire dampers, filters, etc. Doors shall be 12" x 12" for handhole and 24" x 24" for manhole where required. Access doors shall have gasket seals, insulated core and shall be secured air tight.
- C. Flexible Connections: Duct connections to fans and where noted elsewhere on plans shall be sound isolation of fire resistant, water proof, and mildew-resistant canvas. Connections shall not be less than 4" long, shall have suitable metal collar frame on each end, and shall be made with at least 1" slack material.
- D. Opposed Blade Dampers:
  - 1. Construct of galvanized steel blades a maximum width of 6" set in 18-gauge galvanized steel frame with blade stops. Damper blades to be equipped with rigid linkage bar and pivoted using noncorrosive bearings of oilite or nylon.
  - 2. Single or parallel multiple blade dampers shall be of the same quality of construction, but shall not be used unless noted on the Drawings.
- E. Back Draft Dampers: Construct of all aluminum parallel blades a maximum width of 4-1/2" with felt or vinyl tips, 16-gauge aluminum frame with blade stops. Damper blades to be pivoted using noncorrosive bearing of oilite or nylon and shall have blade linkage with adjustable counterbalance as noted.

**2.8 AIR OUTLETS:**

- A. Provide and install grilles, registers, and diffusers as scheduled on the Drawings with accessories as noted.
- B. Acceptable Manufacturers:
  - 1. Metalaire
  - 2. Titus
  - 3. Tuttle & Bailey

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4. Barber Colman
5. Krueger
6. Nailor Industries

- C. Flanged frame grilles, registers, and diffusers to have gasket seals.
- D. Provide insulated plenums, adaptor boxes or square to round transitions for connection to flexible duct runouts where required.

**2.9 LOUVERS:**

- A. Provide and install parallel blade louver compliant with FEMA. Louver shall be minimum 4" deep with 1/2" x .063 basket weave aluminum bird screen. Provide louver sized, finished and with accessories such as mounting clips, mullions, drip mouldings as noted on the Drawings.
- B. Acceptable Manufacturers:
  1. Ruskin
  2. Carnes
  3. United Enertech
  4. Greenheck

Arrow

**2.10 ROOF HOODS:**

- A. Provide and install all aluminum roof hoods with bird screens as sized and noted on the Drawings. Backdraft dampers and other accessories to be furnished and installed as noted on the Drawings.
- B. Acceptable Manufacturers:
  1. Penn
  2. Greenheck
  3. Cook
  4. Carnes
  5. Acme
  6. Or as provided by fan Manufacturer when installed in conjunction with exhaust or supply fan systems.

**2.11 VIBRATION ISOLATION:**

- A. Vibration isolation shall be of the type and deflection for the duty indicated on the Drawings. The vibration isolator supplier shall confirm equipment weights and revolutions (Frequency) with actual products approved and installed by Division 23 Contractor.
- B. All vibration isolators and bases shall be treated for resistance to corrosion.
- C. Size type and deflection of isolators shall conform to recommendations set forth in ASHRAE standards.

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- D. Approved Manufacturers:
  - 1. Amber Booth
  - 2. Mason Industries, Inc.
  - 3. Consolidated Kinetic Corporation

**2.12 EXHAUST FANS:**

- A. Exhaust fans shall be of the type and capacity as scheduled on the Drawings. All fans bear seal of ratings certified by A.M.C.A. Fans shall be furnished and installed with accessories, special coatings, special materials and construction, and controls as noted on the Drawings.
- B. Approved Manufacturers:
  - 1. Penn
  - 2. Greenheck
  - 3. Cook
  - 4. Carnes

**2.13 SPLIT SYSTEM HEAT PUMP:**

- A. Provide heating and cooling split system fan coil airhandling unit, evaporator/condenser coil in fan unit, air cooled outdoor heat pump unit with reversing valve, of the capacities and voltage as scheduled on the Drawings.
- B. Fan coil outdoor heat pump unit shall be of the same Manufacturer and matched for the capacities scheduled on the Drawings. Performance ratings shall comply with those scheduled for the outdoor and coil entering air design data listed on the Drawings.
- C. Fan Coil Features:
  - 1. Cabinet: Constructed of cold-rolled steel finished with baked enamel and fully insulated; duct connection flanges; filter frame and access door; and removable access panels for servicing.
  - 2. Fan: Direct drive, multi-speed blower, dynamically and statically balanced; fan motor overload protection; resilient mounting.
  - 3. DX Coil: Copper tube and mechanically bonded aluminum fins; refrigerant metering device; refrigerant line fittings; condensate drain pan with primary and secondary drain line fittings.
  - 4. Electric Heater: Factory installed; heaters greater than 10 KW shall have current overload protection by fuses or circuit breaker in accordance with N.E.C. Article 424-22; heater over 10 KW shall be wired for 2 stage operation and sequenced off and on in 5 KW increments; all heaters shall have thermal overload protection; 60 VA control circuit; 24 volt transformer and voltage terminal board.
- D. Heat Pump Features: Galvanized heavy gauge steel with enamel finish housing; hermetic spring isolated compressor with crankcase heater and noise shield; thermal and current-sensitive overload protection; compressor internal high pressure protection; outdoor coil construction of copper tube with mechanically bonded aluminum fins; coil refrigerant metering device mounted at liquid service valve; direct drive, propeller condenser fan with factory lubricated, inherently protected, and resiliently mounted motor; low pressure switch; suction line accumulator; pressure relief device; automatic defrost control; liquid line solenoid valve;

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charging valves; liquid line filter dryer; compressor and condenser fan starters; EER and C.O.P. ratings to meet local code requirements for unit performance.

- E. Accessories: Extra set of throwaway filters to install after final acceptance; relays; transformers for control wiring; unit thermostat control as described in Temperature Control Section; precharged refrigerant lines when applicable for distance and routing.
- F. Acceptable Manufacturers:
  - 1. Lennox, no exceptions

**2.14 REFRIGERANT PIPING:**

- A. Precharged and factory insulated refrigerant lines shall be installed for distances less than 50 feet and direct, unconcealed pipe routing. Refrigerant piping shall be type "L" copper, refrigerant grade with wrought copper fittings and with minimum ½ inch Armstrong Armaflex type "FR" or equal insulation.
- B. Pipe sizes shown on the Drawings are for estimating purposes only. Equipment Manufacturer shall verify size of refrigerant piping for system installation.
- C. Refrigerant system shall include liquid filter dryer, strainer, charging valves, relief valves, check valves, sight glass, solenoid valves, and thermostatic expansion valves.

**2.15 SPLIT SYSTEM FURNACES and CONDENSING UNITS:**

- A. Provide heating and cooling split system natural gas fired air handling unit, evaporator/condenser coil in fan unit, air cooled outdoor condensing unit, of the capacities and voltage as scheduled on the Drawings.
- B. Condensing unit shall be of the same Manufacturer and matched for the capacities scheduled on the Drawings. Performance ratings shall comply with those scheduled for the outdoor and coil entering air design data listed on the Drawings.
- C. Furnace Features:
  - 1. Cabinet: Constructed of cold-rolled steel finished with baked enamel and fully insulated; duct connection flanges; filter frame and access door; and removable access panels for servicing.
  - 2. Fan: Direct drive, multi-speed blower, dynamically and statically balanced; fan motor overload protection; resilient mounting.
  - 3. Condensing type high efficiency furnace heat exchanger with PVC combustion air intake pipe and products of combustion PVC flue pipe with combined roof or wall outlet assembly for single penetration of exterior roof or wall.
- D. Accessories: Extra set of throwaway filters to install after final acceptance; relays; transformers for control wiring; unit thermostat control as described in Temperature Control Section; precharged refrigerant lines when applicable for distance and routing.
- E. Approved Manufacturers:
  - 1. Lennox, no exceptions



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**2.16 OTHER MATERIALS:**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/Engineer.

**PART 3 - EXECUTION**

**3.1 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.

**3.2 COORDINATION:**

- A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the Work of this Section.
- B. Slots, Chases, Openings, and Recesses: Through floors, walls, ceilings, and roofs as specified in new structure will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located and shall do any cutting and patching caused by the neglect to do so. No cuts shall be made into any structural element, beam or column, without written approval. Opening in existing structures will be provided by the trade requiring same.
- C. Locations: Of pipes, ducts, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The contractor shall determine the exact route and location of each pipe, duct and electrical raceway prior to fabrication.
  - 1. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, plumbing drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
  - 2. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The contractor shall furnish and install all traps and sanitary vents, etc., as required to effect these offsets, transitions and changes in direction.

**3.3 PREPARATION:**

- A. Holes in Concrete:
  - 1. Provide sleeves, accurately dimensioned and shaped to permit passage of items of this Section.
  - 2. Deliver all such sleeves, with accurate setting Drawings and setting information, to the trades providing the surfaces through which such items must penetrate, and in a timely manner to assure inclusion in the Work.

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- B. Flashing:
  - 1. Where items of this Section penetrate the roof, outer walls or waterproofing of any kind, provide under this Section all base flashing and counterflashing required at such penetration.
  - 2. Provide on each pipe passing through the roof a 4 lb. seamless lead flashing and counterflashing assembly. Penetrations through sheet metal roofs shall be installed per roofing Manufacturer's recommendations.

**3.4 EQUIPMENT INTERFACE:**

- A. Provide all required shutoff valves, unions, and final connections of piping to the Work of this Section.
- B. For electrically operated equipment, verify the electrical characteristics actually available for the Work of this Section and provide equipment meeting those characteristics.

**3.5 DUCTWORK INSTALLATION:**

- A. Rigidly support all interior ductwork using angle iron and galvanized threaded rods or galvanized strap hangers spaced to carry the load but not less than 5'-0" on centers and secured to the building structure in a method approved by the Architect. All hangers shall be installed truly vertical. Ductwork shall be hung level except where Architectural or structural Conditions dictate otherwise.
- B. Flexible ductwork shall not exceed 8'-0" runout total length from tapping to diffuser connection. Make smooth radius bends and secure duct at each end using a method of mechanical fastening with air tight seal. Support duct from resting on ceiling using strap hangers.
- C. Fabric ductwork to be secured to metal duct via strap band secured behind beaded duct collar or manufacturer's standard means and methods of attachment. Secure suspension system to duct reinforced connectors to support duct. Suspension system to be installed in accordance with manufacturer's installation requirements and recommendations and in compliance with Architect and Structural Engineer directives for installation and support of duct systems.
- D. Clean duct system of dirt and debris prior to operating any fan connected to the duct system. Cap all floor outlets and open ductwork during construction until final connections are made.
- E. Duct sizes shown on the Drawings are internal clear dimensions. The Contractor shall adjust for thickness of duct liner required.

**3.6 DUCT HANGER AND SUPPORT INSTALLATION:**

- A. Duct hangers and supports to be secured to the building structure via a method approved by the Architect.
- B. Hanger Minimum Sizes:
  - 1. Up to 30" wide: 1" x 16 ga. at 5 feet spacing.
  - 2. 31" to 48" wide: 1-1/2" x 16 ga. at 5 feet spacing.

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- 3. Over 48" wide: 1-1/2" x 16 ga. at 8 feet spacing.
- C. Horizontal Duct on Wall Supports Minimum Sizes:
  - 1. Up to 18" wide: 1-1/2" x 16 ga. galvanized steel strap or 1" x 1" x 1/8" angles at 8 feet spacing.
  - 2. 19" to 40" wide: 1-1/2" x 1-1/2" x 1/8" angles at 4 feet spacing.
- D. Vertical Duct on Wall Supports Minimum Sizes:
  - 1. At 6'-0" spacing:
    - a. Up to 24" wide: 1-1/2" x 16 ga.
    - b. 25" to 36" wide: 1" x 1" x 1/8"
    - c. 37" to 48" wide: 1-1/4" x 1-1/4" x 1/8"

**3.7 INSULATION:**

- A. Duct liner shall be adhered to interior sides of ductwork with minimum 50% coverage of fire retardant adhesive. Coat all exposed edges with adhesive. Use mechanical fasteners, (12-gauge impale anchor tabs or equal) maximum 16" on centers. Cut off excess fastener length and cover with brush coat of mastic. Liner shall be cut to fit and be without gaps at all joints. Just before sections of ductwork are hung, coat end butt joints of duct liner with adhesive and hang immediately.
- B. Ductwrap shall be firmly secured to ductwork with adhesive applied in 6" widths on 16" centers. Securely fasten insulation in place with 16-gauge annealed tie wire spirals wound 16" on center for straight duct runs and half hitched around duct on 4" centers for elbows and fittings OR tape longitudinal seams on straight duct runs with 2" tape. Butt insulation and seal joints and breaks with 2" tape or foil adhered to vapor barrier. Do not stretch or compress insulation excessively during application.

**3.8 DUCTWORK ACCESSORIES:**

- A. Install items in accordance with Manufacturer's instructions and accepted methods.

**3.9 AIR OUTLETS:**

- A. Install all grilles, registers, and diffusers and their accessories in accordance with Manufacturer's instructions and accepted methods.
- B. Paint interior of all ductwork visible behind air outlets matt black.
- C. Review requirements of outlet sizes, finish, mounting, and air patterns prior to installation. Coordinate location of outlets and make necessary adjustments to conform with Architectural features, symmetry, and light locations. Refer to grille, register and diffuser list for additional requirements.

**3.10 LOUVERS:**

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- A. Set louvers in openings, caulk, and connect to ductwork as shown on the plans. Install per Manufacturer's instruction and Architectural details.

**3.11 ROOF HOODS:**

- A. Set roof hoods on factory or field built curbs and connect to ductwork as shown on the Drawings. Flash, caulk, and seal weather tight per Manufacturer's instructions and Architectural details.

**3.12 VIBRATION ISOLATION:**

- A. Install vibration isolators in accordance with Manufacturer's instructions.

**3.13 EXHAUST FANS:**

- A. Install fans in accordance with Manufacturer's instructions and accepted methods.
- B. Set roof mounted fans on factory or field built curbs and connect to ductwork as shown on the Drawings. Fans manufactured for sloped roofs to be flashed into roofing per Manufacturer's instructions. Flash, counterflash, caulk, and seal water tight per Manufacturer's instructions and Architectural details.
- C. Vibration isolation shall be included in all fan mounting methods as required in the "Vibration Isolation" Section of these Specifications above and as detailed on the Drawings.

**3.14 SPLIT SYSTEM HEAT PUMP:**

- A. Install in accordance with code requirements and Manufacturer's instruction, adhering to required clearances for operation and servicing. Division 23 Contractor to complete ductwork, refrigerant piping, mounting and condensate connections for a fully functional system. Division 26 Contractor to rough-in and make final connections of required electrical and control wiring.
- B. Refrigerant system to be tested and fully charged and complete for a fully functional system.

**3.15 REFRIGERANT PIPING:**

- A. Install refrigerant piping parallel and perpendicular to building structure. Route piping as directly between equipment as possible, using only the minimum number of bends required. Support and hang piping with copper or plastic coated hangers space as required for copper tubing. Joints and fittings to be sweat with SIL-FOS or equivalent silver bearing solder.
- B. Test refrigerant system with Nitrogen at 300 psi.

**3.16 TEMPERATURE CONTROL:**

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- A. Division 26 Contractor shall furnish and install control wiring between HVAC units and BMS control module and control thermostats/sensors.

**3.17 TESTING AND ADJUSTING:**

- A. Test and adjust each piece of equipment and each system as required to assure proper air balance and operation.
  - 1. Test and regulate ventilation and air conditioning systems to conform to the air volumes shown on the design Drawings.
  - 2. Make tests and adjustments in apparatus and ducts for securing the proper volume and face distribution of air for each grille and ceiling outlet.
  - 3. Where required, provide pulleys for fans at no additional cost to the Owner, and set to drive the fan at the speed to give the indicated volume.
  - 4. For each system, take the following data in tabulated form:
    - a. Air volumes at all supply, return, and exhaust outlets
    - b. Total cfm supplied
    - c. Total cfm returned
    - d. Total outdoor air cfm supplied
    - e. Total cfm exhausted
- B. Submit two sets of test and balance reports to the Architect for approval.
- C. Eliminate noise and vibration, and assure proper function of all controls, maintenance of temperature, and operation in accordance with the approved design.

**3.18 EQUIPMENT STARTUP SERVICE:**

- A. Complete installation and startup checks according to manufacturer's written instructions:
  - 1. Start unit according to manufacturer's written instructions.
  - 2. Inspect and record performance of interlocks and protective devices; verify sequences.
  - 3. Calibrate thermostats and sensors.
  - 4. Inspect dampers for proper stroke and interlock.
  - 5. Inspect controls for correct sequencing of heating, cooling, ventilating, positioning dampers, and normal operation, interlock operation and emergency shutdown.
  - 6. Adjust and test control setpoints.
- B. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension for fans with belt drive.
- C. Prepare written report of the results of startup services for all equipment.
- D. Perform Test and Balance of HVAC systems.

**3.19 INSTRUCTIONS:**

- A. Upon completion of this portion of the Work, and prior to its acceptance by the Owner, provide a qualified representative and fully instruct the Owner's maintenance personnel in the proper operation and maintenance of items provided under this Section.

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- B. Demonstrate the contents of the approved operation and maintenance manual required in the "Submittals" Section of these Specifications.

**END OF SECTION**

## SECTION 260400 – ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work Included: Provide complete electrical service entrance, systems and components as shown on the Drawings and as specified herein, along with proper installation of materials and equipment including, but not necessarily limited to:

- 2.01 Basic Materials and Methods
- 2.02 Low-Voltage Electrical Power Conductors and Cables
- 2.03 Grounding and Bonding for Electrical Systems
- 2.04 Hangers and Supports for Electrical Systems
- 2.05 Raceways and Boxes for Electrical Systems
- 2.06 Handholes and Boxes for Exterior Underground Wiring
- 2.07 Sleeve-Seal Systems for Electrical Raceways
- 2.08 Panelboards
- 2.09 Wiring Devices
- 2.10 Fuses
- 2.11 Enclosed Switches and Circuit Breakers
- 2.12 Enclosed Controllers
- 2.13 Interior LED Lighting
- 2.14 Exterior LED Lighting
- 2.15 Lighting Poles and Standards
- 2.16 Surge Protection for Electrical Power Circuits
- 2.17 Other Materials

- B. Drawings:

1. These Specifications are accompanied by floor plans of the building showing the location of the outlets. Exact locations shall be subject to the approval of the Architect who reserves the right to make any reasonable changes in locations indicated, prior to rough-in, without cost to the Owner. While the general run of feeders, branches, and conduits are indicated on the Drawings, it is not intended that the exact routing of circuits or locations of conduits be determined by said Drawings. Detailed arrangements of all Work

shall be subject to the Owner and Architect's approval. Contractor shall coordinate all materials, equipment, devices and routing pathways with all Trades affected by this Scope of Work prior to bidding. Provide written documentation of identified systems which shall require any deviation from the drawings and issue to the Architect prior to bid.

C. 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 the Specifications. Coordinate all requirements for the electrical service entrance with utility company. Deviations identified or discovered during the initial site investigation shall be documented and submitted to the Architect for equivalent Scope-of-Work prior to bid.

D. Temporary Power:

1. Arrange, provide and pay for the costs of installing temporary power to the site in accordance with the requirements of Division 1.

E. Errors in Bid Documents:

1. The documents provided for bidding shall be defined as the Contract Documents inclusive of each Division and defined as all Drawings, Specifications, Addendums, Sketches and documented Request for Information (RFI). The Bidder shall promptly notify the Owner's Representative and the Architect/Engineer of Record upon discovery of any inconsistencies in the Contract Documents and be reported prior to the submitted Bid for proper correction utilizing the Addendum process listed in Division 1. Identified inconsistencies published by the Architect prior to bid shall be the contractor's responsibility for any and all incurred costs.

## 1.2 QUALITY ASSURANCE

- A. Use adequate number of skilled workmen 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. Provide all warning signage and barriers required and as directed by the Owner to maintain the highest quality installation including safety of the overall site conditions.

B. CODES AND ORDINANCES:

1. The installation shall comply with requirements of all applicable laws, codes and ordinances including those of the state, county and city.
  - a. NFPA 70 - 2014.
  - b. NFPA 72 – 2013 (including Fire Marshal Directives)
  - c. NFPA 101 – 2014.
2. Where these Drawings, Design Guidelines and Specifications show more stringent requirements than required codes, the more stringent shall prevail.
3. The Work shall comply with current standards of the serving utility companies and the Contractor shall support the Owner in efforts to coordinate trenches and pathways in unison as to not burden the site with multiple efforts. Provide all necessary materials to match or exceed existing standards of installations from the previous Work.
4. System grounding per ANSI/NFPA70: National Electrodde Code. Performance requirement of grounding system resistance shall be 10 ohms. Furnish products listed and classified by Underwriters Laboratories Inc. to obtain the results listed.

C. PERMITS, FEES AND LICENSES:

1. The Contractor shall obtain and pay for all permits, fees and licenses, for Work required under these Specifications.



D. **UTILITY COMPANY FEES:**

1. Determine the amount of fees and reimbursable construction costs from the utility companies and include that amount as a part of the proposal by line-item qualifiers. The contractor shall pay the utility company directly for all Work required for a complete and operable system.
2. Coordination of existing utilities: Comply with the requirements of the authorities having jurisdiction, and of the utility companies providing electrical power and other services. The existing utilities shall be clearly marked by the Contractor and all parameters that affect the Work shall be submitted to each Division's Contractor for a complete coordinated installation. Failure to notify Division 1 through 26 Contractors of conditions that will cause monetary or construction delays shall be the direct responsibility of the Contractor.

E. Without additional cost to the Owner, provide such other labor and materials as required to complete the Work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

F. Contractor shall coordinate all sub-contractors sequence/phasing of work and proposed equipment installation pathways through the existing building with all other Divisions listed in Specifications prior to final connection.

**1.3 EXAMINATION OF SITE**

- A. All Contractors and Sub-Contractor shall be required to visit the site and inspect the existing Conditions with the Drawings and Specifications so as to be fully informed of the requirements for completion of the Work.
- B. Contractors shall provide contact information on a Pre-construction sign-in sheet. Lack of such information shall constitute the Owner's right of refusal.

**1.4 MATERIAL AND EQUIPMENT**

- A. All materials and equipment shall be new, of the same type and Manufacturer of the existing facility and shall be of the best quality and design, free from defects and meet the requirements of UL and NFPA where standards are established for those items.
- B. A Manufacturer's nameplate affixed in a conspicuous place will be required on each major component of equipment stating Manufacturer's name, address, ratings, capacity and catalog number.
- C. Manufacturer's name and model number used herein and on the Drawings establish type and quality required. Equal products may be considered if submitted in writing to the Engineer/Architect for approval 10 (ten) days prior to bid date. The Contractor shall be responsible for assuring the items and equipment substituted for those shown on the Drawings will physically fit in the space allocated. If substitutions are not submitted as defined, the Contractor shall be responsible for all costs incurred for installation or re-installation of systems.
- D. Firestopping material shall be 3M Fire Seal Caulking, or approved substitution.

**1.5 SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings and Submittal Data:
1. Contractor shall process shop drawings and submittal data to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, all local code requirements and that there are no omissions or duplications in the various Divisions of Work. Contractor shall coordinate with each Division for the proposed submittal data or shop drawings and note on the Submittals Contractor requirements for these coordinated trades prior to sending to Architect. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.
    - a. Shop drawings shall be drawn on a scale not less than ¼ inch equals 1 foot showing actual dimensions. Shop drawings shall include, but not be limited to:
      - 1) Exterior Equipment Pads and Clearances.
    - b. Grounding of Electrical Systems Connections and Diagrams.
    - c. Enclosed Switches and Circuit Breakers.
    - d. Wiring Devices and all equipment specified as an Assembly.
  2. Submittal data (manufacturer's catalog data) shall include Manufacturer's Specifications, product literature and other data needed to demonstrate compliance with the specified requirements, to include but not be limited to the following:
    - a. Equipment: Generators, Transfer Switches, Transformers, Disconnect switches, Circuit Breakers, Fuses, etc.
    - b. Materials: conduit, conductors, connectors, supports, etc.
    - c. Wiring devices.
    - d. Grounding System: Test report and record of location.
  3. Manufacturer's recommended installation procedure which, when approved by the Architect or Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
  4. The submittal data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered and clearly indicating UL Listed ratings.
  5. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.
  6. Assemble submittals on related items procured from a single manufacturer in brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.
  7. The Contractor shall submit shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Architect/ Engineer. Shop drawings shall be prepared at a scale of not less than ¼ inch equals 1 foot.
  8. Contractor shall only submit proposed equipment; materials and devices that are coordinated between all trades of Work listed in the Contract Documents and shall be identified as so on the inside cover of the Submittal packages indicating the affected Divisions. Coordination of Divisions shall be the sole responsibility of the Contractor and lack of coordination resulting in additional service costs shall be paid by the Contractor in addition to any consultant fees incurred by the Owner.
- C. SUBSTITUTIONS
1. Where a single manufacturer is mentioned by trade name or manufacturer's name, it has been done in order to establish a standard rather than to discriminate against an equal product made by another manufacturer.
  2. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.

3. Substitute manufacturers will be considered (10) ten-days prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum ten (10) business days prior to bid with each subparagraph noted with the comment, "COMPLIANCE", "DEVIATION" or "ALTERNATE". In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated along with indicated Divisions affected.
4. The term "COMPLIANCE" shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
5. By noting the term "DEVIATION" shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.
6. By noting the term "ALTERNATE" shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.
7. Where a single manufacturer is mentioned by trade name or manufacturer's name in addition to listing acceptable substitute manufacturers, it has been previously determined that, although the equipment by these manufacturers may include some philosophical design differences from that specified their overall design philosophy and equipment quality are acceptable for the intended application.
8. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal ¼ inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.
9. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Architect/Engineer, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.
10. The Architect/Engineer reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.
11. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

D. SAMPLES:

1. When requested by the Architect/Engineer, promptly provide samples of items scheduled to be exposed in the final structure.
2. When specifically so requested by the Contractor and approved by the Architect/Engineer, approved samples will be returned to the Contractor for installation on the Work.

E. RECORD DRAWINGS:

1. Comply with provisions of Division 1.
2. Include a copy of the Record Drawings and Shop Drawings in each copy of the operation and maintenance manual described below.

F. **MANUAL:**

1. Upon completion of this portion of the Work, and as a Condition of its acceptance, deliver the operation and maintenance manual to the Architect compiled in accordance with the provisions of Division 1 of these specifications. Include within each manual.
  - a. Copy of the approved Record Shop Documents for this portion of the Work.
  - b. Copy of each circuit directory.
  - c. Copy of Testing and Commissioning worksheets indicating parameters.
  - d. Copy of each warranty and guaranty.
  - e. Copy of Training Manuals for complex equipment.

**1.6 PRODUCT HANDLING:**

- A. Comply with pertinent provisions of Division 1. Provide all offloading, logging, verification of conditions and setting of equipment as directed by the manufacturer.
- B. Contractor shall provide the Owner all equipment Training Manuals and any associated software provided by the manufacturer upon receiving products.

**1.7 GUARANTEE:**

- A. The Contractor guarantees all Work against any defects due to faulty workmanship or material and that all raceways, ducts and piping are free from foreign material, obstructions, holes or breaks of any nature.
- B. Upon written notice from the Architect or Owner, the Contractor shall promptly remedy without cost to the Owner any defects occurring within a period of one (1) year from the date of final acceptance.

**1.8 WARRANTY:**

- A. The Contractor shall properly execute in the Owner's name all Manufacturers' standard warranty certificates applying to equipment installed on the project and shall deliver said certificates to the Architect at completion of the job. All warranty cards shall also be properly executed and delivered to the supplier or Manufacturer's representative for Manufacturer's records. Standard warranties for equipment shall be not less than one (1) year.

**PART 2 - PRODUCTS**

**2.1 BASIC MATERIALS AND METHODS**

- A. Provide only materials that are new and of the type and quality specified. Where Underwriter's Laboratories, Inc. have established standards for such materials, provide only materials bearing the UL label and marked for intended location and application.
- B. All terminals and enclosures shall be marked for 75° C operation or conductor size shall be increased as required at no cost to the Owner.
- C. Firestopping material shall be 3M Fire Seal Caulking, or approved substitute.

- D. All interior raceways shall be
- E. Service voltage and color codes for 240/120V: Phase A - Black, Phase B - Red, Phase C – Blue, Neutral – White, and Ground - Green.

## **2.2 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS**

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
  - 1. Section 260400 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
  - 2. Section 270400 "Communications Horizontal Cabling" for cabling used for voice and data circuits.
- C. Submittals:
  - 1. Product Data: For each type of product.
  - 2. Product Schedule: Indicate type, use, location, and termination locations.
- D. Copper Building Wire: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- E. Basis-of-Design Product: Subject to compliance with requirements, provide Southwire Company or comparable product by one of the following:
  - 1. Alpha Wire Company.
  - 2. Cerro Wire LLC.
  - 3. Encore Wire Corporation.
  - 4. General Cable Technologies Corporation.
  - 5. Southwire Company.
- F. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- G. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- H. Conductor Insulation:
  - 1. Type NM: Comply with UL 83 and UL 719.
  - 2. Type RHH and Type RHW-2: Comply with UL 44.
  - 3. Type USE-2 and Type SE: Comply with UL 854.
  - 4. Type THHN and Type THWN-2: Comply with UL 83.
  - 5. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 6. Type XHHW-2: Comply with UL 44.

- I. METAL-CLAD CABLE, TYPE MC
- J. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- K. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. RoHS compliant.
  - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- L. Circuits:
  - 1. Single circuit.
  - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- M. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- N. Ground Conductor: Bare.
- O. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
  - 2. Type XHHW-2: Comply with UL 44.
- P. Armor: Steel, interlocked.
- Q. Jacket: PVC applied over armor.
- R. Connectors and Splices: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and UL Listed and marked for intended location and use.

## 2.3 GROUNDING AND BONDING FOR ELECTRICAL SYSTEM

- A. Submittals:
  - 1. Product Data: For each type of product.
  - 2. Product Schedule: Indicate type, use, location, and termination locations.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.
  - 2. ERICO International Corporation.
  - 3. TE Connectivity Ltd.
  - 4. ILSCO.
  - 5. O-Z/Gedney; a brand of Emerson Industrial Automation.

- C. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- D. Bare Copper Conductors:
  - 1. Stranded Conductors: ASTM B 8.
  - 2. Tinned Conductors: ASTM B 33.
  - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 5. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- E. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.
- F. Connectors: Listed and labeled by an NRTL as complying with NFPA 70, acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 467.
  - 1. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
  - 2. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
  - 3. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
  - 4. Cable-to-Cable Connectors: Compression type, copper or electroplated tinned copper, C and H shaped.
  - 5. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
  - 6. Conduit Hubs: Mechanical type, terminal with threaded hub.
  - 7. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
  - 8. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
  - 9. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
  - 10. Straps: Solid copper, cast-bronze clamp. Rated for 600 A.
  - 11. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
  - 12. Water Pipe Clamps: Tin-plated aluminum or Silicon Bronze. Mechanical type, two pieces with zinc-plated bolts.
- G. Ground Rods: Copper-clad steel, sectional type; 5/8 by 96 inches.
- H. Bond all water piping systems per local codes. Do not bond to gas piping systems within the building.

## 2.4 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.

- c. Thomas & Betts Corporation; A Member of the ABB Group; Metal Framing Channels.
  - d. Unistrut; Part of Atkore International.
- 2. Material: Pre-galvanized steel.
- 3. Channel Width: 1-5/8 inches.
- 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4 for interior non-wet locations.
- 6. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel, Stainless Steel and malleable-iron hangers, clamps, and associated fittings, designed for environment, types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc; Masterset Fastening Systems Unit.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) B-line, an Eaton business.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti, Inc.
      - 4) MKT Fastening, LLC.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.



## 2.5 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

- A. Provide rigid galvanized or sherardized steel conduit, or electrical metallic tubing, with compression type fittings, for all conduit concealed in the walls, above accessible ceilings, or exposed in work areas, except in freezer and dock areas.
  - 1. Indenter or setscrew fittings are not acceptable.
  - 2. Where conduit is installed underground or in the floor slab, provide rigid galvanized steel conduit elbow through slab and Schedule 40 rigid PVC at straight runs.
- B. Where electrical metallic tubing is used, comply with pertinent requirements of the National Electrical Code.
- C. Rigid Nonmetallic Conduits (RNC) may be used for feeders in underground electrical site work. Conduits for power wiring shall be provided with ground wire per NFPA 70 unless it is a Service Entrance.
  - 1. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  - 2. Continuous HDPE: Comply with UL 651B.
  - 3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- D. Metal Wireways And Auxiliary Gutters:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. B-line, an Eaton business.
    - b. Hoffman; a brand of Pentair Equipment Protection.
    - c. MonoSystems, Inc.
    - d. Square D.
  - 2. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R unless otherwise indicated, and sized according to NFPA 70.
    - a. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Boxes, Enclosures and Cabinets:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crouse-Hinds, an Eaton business.
    - b. Erickson Electrical Equipment Company.
    - c. Hoffman; a brand of Pentair Equipment Protection.
    - d. Hubbell Incorporated.
    - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
    - f. RACO; Hubbell.
    - g. Thomas & Betts Corporation; A Member of the ABB Group.
    - h. Wiremold / Legrand.
  - 2. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
  - 3. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
  - 4. Provide standard one-piece units, galvanized or sherardized, of shape and size best suited to that particular location, of sufficient size to contain enclosed wires without crowding.

5. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
6. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
7. Provide deep boxes with 1" and larger conduit.
8. For lighting outlets, provide standard 4" octagon or square units, with 3/8" malleable iron fixture studs and box hangers where required.
9. For switches and receptacles, provide standard ganged switch boxes with plastic or stainless-steel covers as required by Architect; except for exposed Work, provide pressed steel boxes with galvanized or cadmium plated steel covers.
  - a. Provide boxes 4" square by 2-1/8" deep, except for boxes at ends of run where containing a single device.
  - b. 2" x 4" x 2-1/8" deep, except for boxes at ends of run where containing a single device.
  - c. For telephone/communication outlets, provide 4" square boxes with single device cover. Route conduit to accessible ceiling cavity with end bushings and nylon pullstring.
10. For pull boxes, provide galvanized code-gauge sheet steel units with screwed-on covers, of size and shape required to accommodate wires without crowding, and to suit the location. Mark with permanent ink circuit designations on coverplate. If box is to be painted provide permanent ink marking on inside of box cover.
11. For exterior pull boxes, provide cast polymer concrete quazite box with sealed lid identified "ELECTRICAL" at size required to accommodate wires at 40% fill.
12. Provide sleeves and chases where conduits pass through floors and walls, firestopped in accordance with NEC Article 300.21.

## 2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armorcast Products Company.
    - b. NewBasis.
    - c. Oldcastle Enclosure Solutions.
    - d. Quazite: Hubbell Power Systems, Inc.
  2. Standard: Comply with SCTE 77.
  3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  6. Cover Legend: Molded lettering, "ELECTRIC."
  7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

## 2.7 SLEEVE-SEAL SYSTEMS FOR ELECTRICAL RACEWAYS

- A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
  2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- A. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- B. Sleeves for Rectangular Openings:
1. Material: Galvanized sheet steel.
  2. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
    - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.
- C. SLEEVE-SEAL SYSTEMS
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Advance Products & Systems, Inc.
    - b. CALPICO, Inc.
    - c. Metraflex Company (The).
  2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Carbon steel.
  4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.
- D. SLEEVE-SEAL FITTINGS
1. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) HOLDRITE.
      - 2) Presealed Systems.
- E. GROUT
1. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
  2. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
  3. Design Mix: 5000-psi, 28-day compressive strength.
- F. SILICONE SEALANTS
1. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
    - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
  2. A Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

## 2.8 PANELBOARDS

- A. SUBMITTALS
- B. Product Data: For each type of panelboard.
- C. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Include evidence of NRTL listing for SPD as installed in panelboard.
  - 7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- D. Panelboard schedules for installation in panelboards.
- E. Operation and maintenance data.
- F. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
  - 1. Panelboard Warranty Period: Two years from date of Substantial Completion.
- G. PANELBOARDS COMMON REQUIREMENTS
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Comply with NEMA PB 1.
- J. Comply with NFPA 70.
- K. Enclosures: Flush and Surface-mounted, dead-front cabinets as indicated in drawings.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
  - 2. Height: 84 inches maximum.
  - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
  - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
  - 5. A directory card with a clear plastic cover shall be supplied and mounted inside of each door.
  - 6. All locks keyed alike.
- L. Incoming Mains Location: Convertible between top and bottom.
- M. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

- N. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
  4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device where indicated on drawings.
  5. Sub-feed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device where indicated on drawings.
- O. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- P. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
- Q. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
- R. Surge Suppression: Factory installed as an integral part of indicated panelboards in segregated compartment, complying with UL 1449 SPD for the following Types indicated on drawings:
1. Type 1 for service equipment where the device is ahead of the service disconnect.
  2. Type 2 for panelboards on the load side of the service disconnect.
- Provide SPD mounted in NEMA 1 enclosure, exterior of panelboard as indicated on drawings and specified in "Surge Protection for Electrical Power Circuits".
- S. LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS
- T. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. General Electric Company; GE Energy Management - Electrical Distribution.
  3. Square D; by Schneider Electric.
- U. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- V. Mains: Circuit breaker or lugs only.
- W. Branch Overcurrent Protective Devices: Bolt-on circuit breakers or Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- X. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- Y. DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES
- Z. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Standard electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long and short time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
  4. Full-function electronic trip circuit breakers as indicated on drawings with rms sensing; field-replaceable rating plug or electronic trip; digital display, multi-button keypad to access functions, event trip log, communications and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long and short time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
  5. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  7. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
  8. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
  9. Sub-feed Circuit Breakers: Vertically mounted.
  10. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.
    - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
    - h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    - i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    - j. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- AA. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- BB. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- CC. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

## 2.9 WIRING DEVICES

- A. SUBMITTALS
- B. Product Data: For each type of product.

- C. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.
- E. GENERAL WIRING-DEVICE REQUIREMENTS
- F. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Provide ARC Fault circuit interrupter at required areas.
- G. Comply with NFPA 70.
- H. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
- I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- J. STRAIGHT-BLADE RECEPTACLES
  - 1. Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; BR20 or comparable product by one of the following:
      - 1) Eaton (Arrow Hart).
      - 2) Leviton Manufacturing Co., Inc.
      - 3) Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Industrial Heavy Duty, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement SD, and FS W-C-596.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; HBL8300H or comparable product by one of the following:
      - 1) Eaton (Arrow Hart).
      - 2) Leviton Manufacturing Co., Inc.
      - 3) Pass & Seymour/Legrand (Pass & Seymour).
- K. GFCI RECEPTACLES
  - 1. General Description:
    - a. 125 V, 20 A, straight blade, 20 A feed-through type.
    - b. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
    - c. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
    - d. Self-testing technology with indicators including disconnecting power if damaged.
    - e. Provide ARC Fault circuit interrupter at required areas.
  - 2. Duplex GFCI Convenience Receptacles:
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems GFST20 or comparable product by one of the following:
      - 1) Eaton (Arrow Hart).
      - 2) Leviton Manufacturing Co., Inc.
      - 3) Pass & Seymour/Legrand (Pass & Seymour).

L. TWIST-LOCKING RECEPTACLES

1. Twist-Lock, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Hubbell Incorporated; Wiring Device-Kellems; HBL2310.
    - 2) Leviton Manufacturing Co., Inc; 2310.
    - 3) Pass & Seymour/Legrand (Pass & Seymour); L520-R.

M. TOGGLE SWITCHES

N. Comply with NEMA WD 1, UL 20, and FS W-S-896.

O. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Single Pole:
    - 1) Cooper; AH1221.
    - 2) Hubbell; HBL1221.
    - 3) Leviton; 1221-2.
    - 4) Pass & Seymour; CSB20AC1.
  - b. Two Pole:
    - 1) Cooper; AH1222.
    - 2) Hubbell; HBL1222.
    - 3) Leviton; 1222-2.
    - 4) Pass & Seymour; CSB20AC2.
  - c. Three Way:
    - 1) Cooper; AH1223.
    - 2) Hubbell; HBL1223.
    - 3) Leviton; 1223-2.
    - 4) Pass & Seymour; CSB20AC3.
  - d. Four Way:
    - 1) Cooper; AH1224.
    - 2) Hubbell; HBL1224.
    - 3) Leviton; 1224-2.
    - 4) Pass & Seymour; CSB20AC4.

P. WALL PLATES

Q. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

R. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

S. FINISHES



- T. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. SPD Devices: Blue.
- U. Wall Plate Color: For plastic covers, match device color.

## **2.10 FUSES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann, an Eaton business.
  - 2. Edison; a brand of Bussmann by Eaton.
  - 3. Littelfuse, Inc
- B. CARTRIDGE FUSES
  - 1. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
    - a. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
    - b. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
    - c. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting, time delay.
    - d. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
  - 2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. Comply with NEMA FU 1 for cartridge fuses.
  - 4. Comply with NFPA 70.
  - 5. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

## **2.11 ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

- A. Shop Drawings: For enclosed switches and circuit breakers.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include wiring diagrams for power, signal, and control wiring.
- B. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- C. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- F. Comply with NFPA 70.

- G. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- H. Enclosure Finish: The enclosure shall be [finished with] [gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1)] [gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12)] [a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel)] [copper-free cast aluminum alloy (NEMA 250 Types 7, 9)].
- I. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- J. FUSIBLE SWITCHES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton.
    - b. General Electric Company.
    - c. Square D; by Schneider Electric.
  2. Type HD, Heavy Duty:
    - a. Single throw.
    - b. Three pole.
    - c. 240-V ac.
    - d. 200 A and smaller.
    - e. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
    - f. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
  3. Accessories:
    - a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
    - b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
    - c. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
    - d. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
    - e. Service-Rated Switches: Labeled for use as service equipment.
- K. NONFUSIBLE SWITCHES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton.
    - b. General Electric Company.
    - c. Square D; by Schneider Electric.
  2. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
  3. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
  4. Accessories:
    - a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

- b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
- c. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
- d. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
- e. Service-Rated Switches: Labeled for use as service equipment.

**L. DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

**M. Molded-Case Circuit Breaker (MCCB):** Comply with UL 489, with interrupting capacity to meet available fault currents.

- 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
  - a. Instantaneous trip.
  - b. Long- and short-time pickup levels.
  - c. Long and short time adjustments.
  - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
- 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
- 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
- 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
- 7. MCCB Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
  - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
  - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

**2.12 ENCLOSED CONTROLLERS**

**A. SUBMITTALS**

- 1. Product Data: For each type of enclosed controller.
- 2. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.
  - a. Wiring Diagrams: For power, signal, and control wiring.
- 3. Operations and maintenance data.

**B. FULL-VOLTAGE CONTROLLERS**

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Eaton.
    - b. General Electric Company.
    - c. Square D; by Schneider Electric.
  - 2. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
  - 3. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
  - 4. Configuration: Non-reversing.
    - a. Surface mounting.
    - b. Pilot light.
    - c. Hand-Off-Auto.
- C. FRACTIONAL HORSEPOWER MANUAL CONTROLLERS: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
- 1. Configuration: Non-reversing.
    - a. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
    - b. Surface mounting.
    - c. Pilot light.
- D. INTEGRAL HORSEPOWER MANUAL CONTROLLERS: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
- 1. Configuration: Non-reversing.
    - a. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 20 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button; bimetallic type.
    - b. Surface mounting.
    - c. Pilot light.
- E. MAGNETIC CONTROLLERS: Full voltage, across the line, electrically held.
- 1. Configuration: Non-reversing.
  - 2. Contactor Coils: Pressure-encapsulated type.
    - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
  - 3. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
  - 4. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
  - 5. Melting Alloy Overload Relays:
    - a. Inverse-time-current characteristic.
    - b. Class 10 tripping characteristic.
    - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
  - 6. Bimetallic Overload Relays:
    - a. Inverse-time-current characteristic.
    - b. Class 10 tripping characteristic.
    - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
    - d. Ambient compensated.
    - e. Automatic resetting.
  - 7. Solid-State Overload Relay:
    - a. Switch or dial selectable for motor running overload protection.

- b. Sensors in each phase.
    - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    - d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    - e. Analog communication module.
  - 8. External overload reset push button.
- F. COMBINATION MAGNETIC CONTROLLER: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.
- 1. Fusible Disconnecting Means:
    - a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class R fuses.
    - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    - c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
  - 2. Non-fusible Disconnecting Means:
    - a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
    - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    - a. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
  - 3. MCP Disconnecting Means:
    - a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
    - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    - c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
  - 4. MCCB Disconnecting Means:
    - a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
    - b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
    - c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
    - d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
- G. ENCLOSURES
- 1. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
    - a. Dry and Clean Indoor Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
    - c. Kitchen or Wash-Down Areas: Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: Type 4.
    - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.
- H. ACCESSORIES
- 1. Push Buttons, Pilot Lights, and Selector Switches: NEMA ICS 5; heavy-duty type; factory installed in controller enclosure cover unless otherwise indicated.

2. Control Relays: Auxiliary and adjustable time-delay relays.
- A. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

## **2.13 INTERIOR LED LIGHTING**

- A. SUBMITTALS
  1. Product Data: For each type of product, arranged by designation.
    - a. Include highlighted rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
    - b. Photometric calculations on floorplans indicating footcandle values for luminaires requesting substitution or deviations.
  2. Shop Drawings: For non-standard or custom luminaires.
    - a. Indicate dimensions, weights, loads, required clearances, method of assembly, components, location and size of field connections.
    - b. Diagrams for power, signal and control wiring.
    - c. Photometric calculations on floorplans indicating footcandle values for luminaires requesting substitution or deviations.
  3. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- B. LED TROFFER MANUFACTURERS
  1. Pre-Approved Manufacturers Listed: Products of firms regularly engaged in the manufacture of recessed LED lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years. The manufacturer of the lighting fixtures shall comply with the provisions of the appropriate code and standards. All fixtures shall be pretested before shipping. Provisions for a single fixture shipped to the project site shall become property of the Owner to test and evaluate the construction meets or exceeds the original fixture approved by the Owner and listed in the fixture schedule.
  2. Conformance: Fixtures shall be manufactured in strict accordance with the Contract Drawings and Specifications.
  3. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.
  4. UL or CSA US Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the "Standards for Safety" to UL 8750 or others as they may be applicable. A listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.
  5. Luminaire Flat Panel Edge Lit shall be DLC Premium Certified (Design Lights Consortium).
  6. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
  7. Base Bid Manufacturers: Are listed on fixture schedule and specification. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.
  8. Alternate Manufacturers: Identification by means of manufacturers names and catalog numbers is to establish basic features, quality and performance standards. Any substitutions must meet or exceed these standards. The three listed manufacturers are

pre-approved Owner's standard fixtures and substitution request may not be allowed prior to bid.

C. LED LUMINAIRE SOURCE REQUIREMENTS

1. LED's shall be manufactured by, Nichia, Cree, Samsung or Osram.
2. Lumen Output – minimum initial lumen output of the luminaire shall be as follows for the lumens exiting the luminaire in the 0-90-degree zone - as measured by IESNA Standard LM-79-08 in an accredited lab. Exact tested lumen output shall be clearly noted on the shop drawings.
  - a. Type 2x4: 40-Watt, Efficacy (lm/W) >123 @ 4000K for ceilings up to 10'-0".
  - b. Type 2x4: 48-Watt, Efficacy (lm/W) >124 @ 4000K for ceilings 10'-1" to 12'-0".
  - c. Type 2x2: 30-Watt, Efficacy (lm/W) >121 @ 4000K for ceilings up to 10'-0".
  - d. Type 2x2: 40-Watt, Efficacy (lm/W) >119 @ 4000K for ceilings 10'-1" to 12'-0".
  - e. 4-Ft Strip: 45-Watt, Efficacy (lm/W) >128 @ 4000K.
3. Recessed Fixtures: Comply with NEMA LE 4.
4. Rated lamp life of 50,000 hours. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
5. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
6. LED Boards shall be suitable for field maintenance or replacement with plug-in connectors at power supply/driver.
7. Light Color/Quality:
  - a. Correlated Color temperature (CCT) range as per specification, luminaire sources and 4000K shall be correlated to chromaticity as defined by the absolute (X, Y) coordinates on the 2- D CIE chromaticity chart.
  - b. The color rendition index (CRI) shall be 82 or greater.
  - c. Chromaticity shift over 6,000 hours shall be <0.007 change in delta-u'v' average as demonstrated data set in IESNA LM-80-08 report.
  - d. Lumen Maintenance Factor: >0.84 at 25°C, 50,000 hours and reported in TM-21 L70 Lifetime >60,000 hours.
  - e. Binning: Per ANSI, 3-step MacAdam ellipse with abilities to produce uniform color across copious quantities of fixtures.

D. LED LUMINAIRE POWER SUPPLY AND DRIVE REQUIREMENTS

1. Driver: Instant start. 120 – 277 Volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
  - a. Flat Panel Edge-lit LED: The electronics/power supply enclosure shall be external to the SSL luminaire and be accessible per UL requirements.
2. Dimming: Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100% to 5% of rated lumen output with a smooth shut off function. Dimming shall be controlled by a 0-10V signal. Signal wires shall be 22 AWG solid copper minimum.
3. Compatible with Leviton dimming device(s): DS710-10Z or equal.
4. Electrical Characteristics:
  - a. Power Factor: >0.93.
  - b. Input Power: 120-277V, 50/60 Hz.
  - c. Total Harmonic Distortion (THD): <20%.
  - d. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.
5. Material Usage: Drivers shall be (ROHS)-compliant.

E. LED EDGE-LIT FLAT PANEL CONSTRUCTION

1. Frame: LED strips mounted on edges enclosed in solid extruded aluminum frame, painted after formed with UV-stabilized acrylic optical lens with a full aluminum back. Construction seals conditioned air from the plenum or non-conditioned air. Housing shall be designed rigid to eliminate warping or bending for level installation. Frame corners conformed for seamless appearance.
2. Optical Lens/Diffusers:
  - a. Acrylic: One hundred percent virgin UV-stabilized acrylic (PMMA) optical panel, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.
4. Each luminaire shall be designed to operate at an average operating temperature -4°F to 104°F.
5. Humidity: 20% – 85% RH, Lighting Facts.
6. Luminaire housing to have no visible welding, screws, springs, hooks, rivets, bare LED's or plastic supports in viewing angles at floor to ceiling placement.
7. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be fundamental to the unit.
8. Driver disconnect shall be provided where required to comply with codes.
9. Finish: Polyester white powder coat painted with 92% high-reflective paint after fabrication.
10. Integral Grid Clips required on recessed mounted luminaires along with integral tie wire mounting points. Compatible with standard 15/16" and 9/16" T-Bar ceilings.
11. Luminaire to have air removal capability where specified.

F. LED LUMINAIRE CONSTRUCTION (KITCHENS)

1. Construction:
  - a. Shallow 3-1/4" deep extruded aluminum housing with internal high angled distribution.
  - b. Injection molded composite end plates securely attached with screws without gaps.
  - c. Four suspension mounted points.
  - d. Durable frame with high reflectance baked enamel finish.
2. Optics/Shielding: High optical grade acrylic lens.
3. Electrical System: Integral, high-efficiency driver. 120-277V 50/60 Hz. 0.9 Power Factor at full load. <20% THD at full load. Operating temperature -40°F - +104°F.
4. Efficacy: Less than 10' ceiling heights (LPW): >125 at 43W. Greater than 10' ceiling heights (LPW): >147 at 57W.
5. Color Temperature: 5000K minimum.
6. CRI: 80.
7. Options: Provide Wet Location/Wipe Down where located in dishwasher areas with hose-bibb.

G. LED HIGH EFFICIENT HIGH BAY LUMINAIRE CONSTRUCTION

1. Construction:
  - a. Full body construction, 22-Gauge.
  - b. Stiffening brackets and side rails.
  - c. Low-profile, lightweight design.
  - d. Suspension mounted with wire hook and chain set or cable mounting.
  - e. 16/3 AWG white power cord.
2. Optics/Shielding: Acrylic lens, wireguard and doorframe. LED system delivers wide distribution, uniformity & spacing.



3. Electrical System: Integral, high-efficiency driver. 120-277V 50/60 Hz. 0.9 Power Factor at full load. <20% THD at full load. Operating temperature -40°F - +104°F.
4. Efficacy: Medium Lumens for lower ceiling heights (LPW): >155 Lumens at 115W. High Lumens for higher ceiling heights (LPW): >161 Lumens at 146W.
5. Color Temperature: 5000K minimum.
6. CRI: 80.

#### H. LED SUSPENDED DIRECT/INDIRECT LUMINAIRE CONSTRUCTION

1. Frame: Housing is one piece die-formed cold rolled steel, forming 9"x2-1/2" curved profile. Modular 4'-0" and 8'-0" sections combined for continuous runs. Standard straight and optional beveled endcaps, die-cast aluminum mechanically attached without exposed fasteners.
2. Optics/Shielding: Precision formed optical assembly with One hundred percent virgin UV-stabilized acrylic (PMMA) optical panel, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation for direct/indirect optical distributions.
3. Direct/Indirect LED Source: Field replaceable LED sources for maintaining minimum 61% downlight, 39% up-light.
4. Efficacy (LPW): >101 Lumens at 46W.
5. Color Temperature: 4000K minimum.
6. CRI: <85.

#### I. LED LUMINAIRE SUPPORT COMPONENTS

1. Comply with requirements in Section 260400 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
2. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
3. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
4. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
5. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.
6. Drywall Grid Adapter: Provide adapter frame for recessed fixture installation into drywall ceilings.
7. Surface or cable mounting capabilities with accessory kits.
8. Pendant Kits: Joiners to accept stems, single aircraft cable and power cords with optional design types.

#### J. DOWNLIGHTING

1. Compact and efficient shallow recessed remodel housing optimized and listed for EISA compliant LED lamps.
  - a. Housing:
    - 1) Single wall die-formed shallow aluminum housing.
    - 2) Interlocking collar to maintain aperture geometry.
    - 3) Integral air-tight gasket between fixture and finished ceilings.
    - 4) Removable from plaster frame to provide access.
    - 5) Suitable for light commercial shallow ceiling applications. For installation in insulated ceilings and non-insulated ceilings with airtight code compliant construction.
    - 6) Available with a variety of trims and finishes.
  - b. Socket Plate:
    - 1) Rigid socket plate adjusts to locks without tools for lamp sizes indicated.
    - 2) Removeable socket plate and bracket for trims.
  - c. Plaster Frame:
    - 1) Galvanized steel frame. Housing adjust to 3/8" to 1" ceiling thickness.

- 2) (2) regressed locking screws for securing hangar bars.
- 3) Integral air-tight gasket housing.
- d. Socket:
  - 1) Porcelain socket with nickel plated brass screws shell.
  - 2) Snap-on springs secure socket in plate, and detachable when using trims.
- e. Compliance:
  - 1) cULus Listed Damp Location.
  - 2) cULus Listed for Wet Location, covered ceiling, with select trims.
  - 3) cULus Listed for direct contact with insulation and combustible material other than spray foam insulation.
  - 4) Air-Tite code compliant. Certified under ASTM E283; not exceeding 2.0 cfm (0.944 L/s) air leakage rate tested at a 1.57 psf (75 Pa) pressure differential.
  - 5) RoHS compliant.
- f. Lamp: Cree or Satco LED luminaire.

#### K. EXIT SIGNS

- 1. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- 2. Internally Lighted Signs:
- 3. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
- 4. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
  - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
  - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
  - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
  - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- 5. Master/Remote Sign Configurations:
  - a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
  - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

#### L. EMERGENCY LIGHTING UNITS

- 1. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
  - a. Battery: Sealed, maintenance-free, lead-acid type.
  - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - c. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects

from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

- d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
- e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- f. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
- g. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
- h. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red

## **2.14 EXTERIOR LED LIGHTING**

### **A. SUBMITTALS**

- 1. Product Data: For each type of product, arranged by designation.
  - a. Include highlighted rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - b. Photometric calculations on floorplans indicating footcandle values for luminaires requesting substitution or deviations.
- 2. Shop Drawings: For non-standard or custom luminaires.
  - a. Indicate dimensions, weights, loads, required clearances, method of assembly, components, location and size of field connections.
  - b. Diagrams for power, signal and control wiring.
  - c. Photometric calculations on floorplans indicating footcandle values for luminaires requesting substitution or deviations.
- 3. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

### **B. LUMINAIRE REQUIREMENTS**

- 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 2. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- 3. UL Compliance: Comply with UL 1598 and listed for wet location.
- 4. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- 5. CRI of minimum 80. CCT of 4100 K.
- 6. L70 lamp life of 50,000 hours.
- 7. Nominal Operating Voltage: 120 V ac.
- 8. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.
- 9. Source Limitations: Obtain luminaires from single source from a single manufacturer.

### **C. LUMINAIRE TYPES**

- 1. Refer to Drawings, Light Fixture Schedule for types and referred item numbering.

### **D. MATERIALS**

- 1. Metal Parts: Free of burrs and sharp corners and edges.
- 2. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

3. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
  4. Diffusers and Globes:
    - a. Glass: Annealed crystal glass unless otherwise indicated.
  5. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
  6. Housings:
    - a. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
    - b. Provide filter/breather for enclosed luminaires.
- E. FINISHES
1. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- F. LUMINAIRE SUPPORT COMPONENTS
1. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

## 2.15 LIGHTING POLES AND STANDARDS

- A. SUBMITTALS
1. Shop Drawings:
    - a. Include plans, elevations, sections, and mounting and attachment details.
    - b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - c. Detail fabrication and assembly of poles and pole accessories.
    - d. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
    - e. Anchor bolt templates keyed to specific poles and certified by manufacturer.
    - f. Method and procedure of pole installation. Include manufacturer's written installations.
- B. WARRANTY
1. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.
- C. PERFORMANCE REQUIREMENTS
1. Structural Characteristics: Comply with AASHTO LTS-6-M.
  2. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.
  3. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.
    - a. Basic wind speed for calculating wind load for poles 50 feet or less is 100 mph.

- 1) Wind Importance Factor: 1.0.
  - 2) Minimum Design Life: 25 years.
  - 3) Velocity Conversion Factor: 1.0.
  4. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.
- D. POLE ACCESSORIES
1. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.
- E. MOUNTING HARDWARE
1. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi.
    - a. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
    - b. Bent rods ½" in diameter by twelve in length.
    - c. Threading: Uniform National Coarse, Class 2A.
  2. Nuts: ASTM A 563, Grade A, Heavy-Hex
    - a. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
    - b. Four nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.
  3. Washers: ASTM F 436, Type 1.
    - a. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
    - b. Two washers provided per anchor bolt.
- F. GENERAL FINISH REQUIREMENTS
1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  2. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.16 SURGE PROTECTION FOR ELECTRICAL POWER CIRCUITS

- A. SUBMITTALS
1. Product Data: For each type of product.
    - a. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
    - b. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
  2. Operation and maintenance data.
  3. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
    - a. Warranty Period: Five years from date of Substantial Completion.
- B. GENERAL SPD REQUIREMENTS
1. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Comply with NFPA 70.
  3. Comply with UL 1449.
  4. MCOV of the SPD shall be the nominal system voltage.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Eaton.
4. Northern Technologies, Inc.
5. Square D; by Schneider Electric.
6. SSI, an IlSCO Company.

D. SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

1. SPDs: Comply with UL 1449.
  - a. Type 1 for service equipment where the device is ahead of the service disconnect.
  - b. Type 2 for panelboards on the load side of the service disconnect.
  - c. SPDs with the following features and accessories:
    - 1) Integral disconnect switch.
    - 2) Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
    - 3) Indicator light display for protection status.
    - 4) Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
    - 5) Surge counter.

E. PANEL SUPPRESSORS

1. SPDs: Comply with UL 1449.
  - a. Type 1 for service equipment where the device is ahead of the service disconnect.
  - b. Type 2 for panelboards on the load side of the service disconnect.
  - c. Include LED indicator lights for power and protection status.
  - d. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

F. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

G. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Line to Line: 1000 V for 208Y/120 V.

H. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

I. SCCR: Equal or exceed 200 kA.

J. Inominal Rating: 20 kA.

K. ENCLOSURES

1. Indoor Enclosures: NEMA 250, Type 1.
2. Outdoor Enclosures: NEMA 250, Type 3R.

## **2.17 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/Engineer.
- B. Provide required equipment interlocking were 110 voltages provide a complete operable system for all Work by other Trades and coordinate requirements prior to final rough-in. These systems include, but shall not be limited to:
  - 1. Wiring and supply of control transformers for other control systems stepped down from 110 volts. Coordinate with Division's 13 and 15.

## **PART 3 - EXECUTION**

### **3.1 ELECTRICAL SITE COORDINATION AND PREPARATION**

- A. Examine the areas and the Conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of this work. Do not proceed until unsatisfactory conditions are corrected.
- B. Coordinate with local utility company temporary and permanent power requirements for the project. Provide a request for all utilities to be located and marked at project site prior to the start of Work. Prepare site easements for saw-cutting, trenching and backfill. Coordinate power outages with Owner and utility company 10-days prior to outage.
- C. Coordination with Division Trades:
  - 1. Coordinate as necessary with other trades to assure proper and adequate provision in this Work of those trades for interface with the Work of this Section.
  - 2. Coordinate the installation of electrical items with the schedule for Work of other trades to prevent unnecessary delays in the total Work.
  - 3. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, provide required supports and wiring to clear the encroachment.
  - 4. Provide 110-volt temperature control, control transformers in enclosures and interlock wiring. Coordinate all requirements with mechanical contractor prior to rough-in and installation.
  - 5. Provide weatherproof ground-fault receptacles within 25'-0" of devices and equipment to be readily-accessible for maintenance.
- D. Coordinate arrangement, mounting and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. Provide for ease of disconnecting the equipment with minimum interference to other equipment installations.
  - 3. Allow right-of-way for piping and conduit installed at required slope.
  - 4. Connecting raceways, cables, wireways, cable trays and busways to be clear of obstructions and allow working clearances of other equipment.
- E. Where outlets are not specifically located on the Drawings, locate as determined in the field by the Architect. Where outlets are installed without such specific direction, relocate as directed by the Architect and at no additional cost to the Owner.
- F. The Electrical Drawings are diagrammatic but are required to be followed as closely as actual construction and Work of other trades will permit. Where deviations are required to conform

with actual construction and the Work of other trades, make such deviations without additional cost to the Owner.

### **3.2 INSTALLATION OF LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS**

- A. Conductor Material Applications:
  - 1. Feeders: Copper for feeders smaller than No. 250 MCM; copper or aluminum for feeders No. 250 MCM and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Adjust raceway sizes accordingly where use of aluminum material is allowed.
  - 2. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
  - 3. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.
- B. Conductor Insulation and Multiconductor Cable Applications and Wiring Methods:
  - 1. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
  - 2. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
  - 3. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
  - 4. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
  - 5. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
  - 6. Branch Circuits Concealed in Millwork and Wall Partitions: Metal-clad cable, Type MC.
  - 7. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- C. Installation of Conductors and Cables:
  - 1. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
  - 2. Complete raceway installation between conductor and cable termination points according to Section 260400 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
  - 3. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
  - 4. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
  - 5. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
  - 6. Support cables according to Section 260400 "Hangers and Supports for Electrical Systems."
- D. Connections:
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
  - 2. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- E. Identification: Identify and color-code conductors and cables according to NFPA 70. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.



- G. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260400 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- H. Other Requirements:
  - 1. Conductors No. 4 and larger, provide insulating bushings or insulating sleeves.
  - 2. Provide barriers in boxes where different voltages and conductor insulation exist.
  - 3. Install control wiring for equipment or as required by other Division Trade Work.
  - 4. Tape all joints with rubber tape 1-1/2 times the thickness of the conductor insulation, then cover with a minimum of two half-lapped layers of Scotch Brand No. 33 vinyl-plastic electrical tape.
  - 5. Provide expansion fittings in conduits which are non-continuous and exposed to the weather.
- I. Wire Sizes:
  - 1. Increase wire sizes and raceway to next largest AWG size for: (Size shown of 60% load, increase as required for larger loading)
    - a. 120 volt circuits exceeding 150 feet in circuit length.
    - b. 208 volt circuits exceeding 250 feet in circuit length.
  - 2. Wire sizes shall be increased for the above conditions whether indicated on the Drawings.
- J. Use identified (white) neutrals and colored-coded phase wires for all branch circuit wiring.
  - 1. Make splices electrically and mechanically secure with pressure-type ILSCO Snapblock connectors, or LSI lugs to make splices electrically and mechanically secure. Soldering is not permitted for grounding equipment.
    - a. For wires size 6 AWG and smaller, provide "Scotch-lock" connectors.
    - b. For wires size 4 AWG and larger, provide Burndy "Versitaps" and heavy-duty connectors, or T&B "lock-tite" connectors.

### **3.3 INSTALLATION OF GROUNDING SYSTEMS**

- A. Coordinate existing conditions and wiring configurations to assure proper grounding systems are installed per NEC Art. 250. Where existing system grounding means are not known or clearly identifiable, contact Owner to provide as-built documents prior to start of Work.
- B. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- C. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches below grade.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.
- F. Grounding at The Service: Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.
- G. Grounding Separately Derived Systems: Generator - Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.
- H. Comply with IEEE C2 grounding requirements.
- I. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- J. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- K. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation. Coordinate with the local utility company requirements and specifications for utility transformers prior to Work.
- L. Equipment Grounding: Install insulated equipment grounding conductors with all feeders and branch circuits.
- M. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- N. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- O. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- P. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

- Q. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- R. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- S. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- T. Perform tests and inspections.
- U. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
  5. Prior to energizing main switchboards with GFPE, disconnect switchboard neutral link or terminal to which the neutral conductor is connected. Once link is removed, test to verify that the neutral is isolated from grounding connections on the load side of the service disconnect. Once the tests is completed, the testing agency shall field label the equipment with the results and date listed. Test records must be made available to the Engineer of Record and AHJ

- V. Grounding system will be considered defective if it does not pass tests and inspections.
- W. Prepare test and inspection reports.
- X. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  - 5. Substations and Pad-Mounted Equipment: 5 ohms.
  - 6. Manhole Grounds: 10 ohms.
- Y. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

### **3.4 HANGERS AND SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70 utilizing listed beam clamps and supports. Tie-wires shall not be an acceptable method of securing raceways.
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- F. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .
- G. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  7. To Light Steel: Sheet metal screws.
  8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- H. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- I. Concrete Bases:
1. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
  2. Use 3000-psi , 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified by equipment manufacturer.
  3. Anchor equipment to concrete base:
    - a. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    - b. Install anchor bolts to elevations required for proper attachment to supported equipment.
    - c. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### **3.5 RACEWAYS AND BOXES INSTALLATION**

- A. Where conduit is installed concealed in walls or above the ceiling, or exposed in work areas, provide rigid galvanized conduit or electrical metallic tubing with compression-type fittings.
- B. Junction boxes may not be installed back-to-back in walls and partitions. Consult with Architect for proper separation of boxes - 12" in non-rated walls, 24" in rated walls.
- C. Schedule 40 PVC may be used for branch circuits under floor slab. All PVC conduits shall be provided with ground wire per NEC.
1. Seal joints to prevent entrance of water.
  2. Provide ground wire per NEC Table 250-95.
  3. Use nylon (rather than steel) fish tape.
- D. Use flexible conduit only for short motor connections, or where subject to vibration. Provide weatherproof flexible conduit at exterior locations.
- E. Provide necessary sleeves and chases where conduits pass through floors and walls, and provide other necessary openings and spaces, arranging for in proper time to prevent unnecessary cutting in connection with the work. Perform cutting and patching in accordance with the provisions for the original Work.
- F. Where conduit or wiring is exposed, run parallel to, or at right angles with, lines of the building.
1. Make bends with standard conduit elbows or conduit bent to not less than the same radius.
  2. Make bends free from dents and flattening.
  3. Where outlets and devices are installed exposed on masonry walls, contractor shall route conduit up to highest point on wall to junction box serving the device vertically.
- G. Securely and rigidly support conduits to super structure throughout the Work.

- H. Where conduits pierce the roof, provide 24-gauge galvanized iron roof jacks and flashing collar brazed onto the conduits and covering the top of the roof jacks. Any brazing shall occur prior to installation of conductors.
- I. When boring, cutting or drilling structural wood or wall members, drill only in locations as approved by the Architect.
- J. INSTALLATION OF UNDERGROUND CONDUIT
- K. Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit 36-inch below grade and 24-inch below finished slab-on-grade. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
  - 2. Install backfill as specified in Section 312000 "Earth Moving."
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
  - 4. Install manufactured rigid steel conduit elbows for stub-ups at poles, equipment pads and at building entrances through floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
    - c. For PVC stub-ups at equipment mounted on concrete bases with formed raceway opening to enter cabinets, enclosures and boxes. Install PVC End Bell on service conduits for conductors No. 4 AWG and larger prior to pulling conductors.
  - 5. Underground Warning Tape: Provide at all utility and onsite generation for service entrances and comply with requirements listed by the Owner and local utility company.

### **3.6 INSTALLATION OF HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, 24" below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### **3.7 SLEEVE-SEAL SYTEM INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
  - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
  - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work and as specified by roofing manufacturer.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.
- H. SLEEVE-SEAL-SYSTEM INSTALLATION
  - 1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
  - 2. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and

sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

I. **SLEEVE-SEAL-FITTING INSTALLATION**

1. Install sleeve-seal fittings in new walls and slabs as they are constructed.
2. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
3. Secure nailing flanges to concrete forms.
4. Using grout, seal the space around outside of sleeve-seal fittings.

**3.8 PANELBOARD INSTALLATION**

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Mount top of trim 90 inches above finished floor where top-most operating handle is not higher than 79 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
  1. Set field-adjustable, circuit-breaker trip ranges.
- G. Provide breakers with ground-fault protection of equipment for listed areas:
  1. Kitchens.
  2. Garages.
  3. Bathrooms and Locker Rooms.
  4. Exterior equipment not supplied with integral ground-fault protection.
  5. Mechanical and Janitorial closets for equipment not supplied with integral ground-fault protection.
  6. Locations where equipment is located within 6'-0" of water source or listed wet locations.
- H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- I. Install filler plates in unused spaces.
- J. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or floor below slab not on grade.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- L. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with OSHA and NFPA 70E.
- M. Panelboard Nameplates: Label each switchboard compartment with a nameplate.



- N. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate.
- O. Test and Inspections: Section 260400 "Testing and Inspections."
  - 1. Panelboards will be considered defective if they do not pass tests and inspections.

### **3.9 INSTALLATION OF WIRING DEVICES**

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.

### **3.10 INSTALLATION OF FUSES**

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install labels complying with requirements for identification specified in "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

### **3.11 INSTALLATION OF ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

- A. ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS
  - 1. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
    - a. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
    - d. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

- e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
  - f. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 with cover attached by Type 316 stainless steel bolts.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Owner no fewer than ten days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Owner or Construction Manager's written permission.
  - 4. Comply with NFPA 70E.
- C. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- D. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.
- G. IDENTIFICATION
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.
- H. Test and Inspections: Section 260400 "Testing and Inspections."
  - 1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- I. Prepare test and inspection reports.
  - 1. Test procedures used.
  - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
  - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

### **3.12 INSTALLATION OF ENCLOSED CONTROLLERS**

- A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height, and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with "Hangers and Supports for Electrical Systems."
- B. Floor-Mounted Controllers: Section 260400 "Installation of Power Equipment."
- C. Install fuses in each fusible-switch enclosed controller.

- D. Install fuses in control circuits if not factory installed. Comply with requirements in "Fuses."
- E. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- F. Comply with NECA 1.
- G. IDENTIFICATION
  - 1. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in "Identification for Electrical Systems."
    - a. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
    - b. Label each enclosure with engraved nameplate.
    - c. Label each enclosure-mounted control and pilot device.
- H. CONTROL WIRING INSTALLATION
  - 1. Install wiring between enclosed controllers and remote devices and facility's central control system. Comply with requirements in "Control-Voltage Electrical Power Cables."
  - 2. Bundle, train, and support wiring in enclosures.
  - 3. Connect selector switches and other automatic-control selection devices where applicable.
    - a. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
    - b. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.
- I. FIELD QUALITY CONTROL
  - A. Test and Inspections: Section 260400 "Testing and Inspections."
    - 1. Enclosed controllers will be considered defective if they do not pass tests and inspections.
    - 2. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
  - B. ADJUSTING
    - 1. Set field-adjustable switches and overload-relay pickup and trip ranges.
    - 2. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Engineer of Record before increasing settings.
  - C. DEMONSTRATION: Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

### **3.13 INSTALLATION OF INTERIOR LIGHTING**

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
  - 1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
  - 2. Ceiling mount with pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
  - 3. Ceiling mount with hook mount.
- H. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
  - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
  - 1. Secure to any required outlet box.
  - 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- J. Comply with requirements in Section 260400 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.
- K. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260400 "Identification for Electrical Systems."
- L. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
  - 3. Photometric Requirements:
    - a. The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.
    - b. The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
    - c. The measurements shall be calibrated to standard photopic calibrations.
    - d. Luminaire shall be tested per IESNA LM 79-08.
- M. Luminaire will be considered defective if it does not pass operation tests and inspections.
- N. Prepare test and inspection reports.

### **3.14 INSTALLATION OF EXTERIOR LIGHTING**

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning and relamping.
  - 3. Support luminaires without causing deflection of finished surface.
  - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- K. Comply with requirements in Section 260400 "Low-Voltage Electrical Power Conductors and Cables" and 260400 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.
- L. INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES
- M. Aim as indicated on Drawings.
- N. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."
- O. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- P. IDENTIFICATION
- Q. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260400 "Identification for Electrical Systems."
- R. FIELD QUALITY CONTROL
- S. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

- T. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Verify operation of photoelectric controls.
- U. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
    - a. IES LM-48, LM-50 and LM-64.
  - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- V. Luminaire will be considered defective if it does not pass tests and inspections.
- W. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

### **3.15 LIGHTING POLES AND STANDARDS EXECUTION**

- A. POLE FOUNDATION
- B. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor Bolts: Install plumb using manufacturer-supplied steel template, uniformly spaced.
- D. POLE INSTALLATION
  - 1. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
  - 2. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
  - 3. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.
- E. CORROSION PREVENTION
  - 1. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.
  - 2. Steel Conduits: Comply with requirements in Section 260400 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50-percent overlap.
- F. GROUNDING
  - 1. Ground Metal Poles and Support Structures: Comply with requirements in Section 260400 "Grounding and Bonding for Electrical Systems."
    - a. Install grounding electrode for each pole unless otherwise indicated.
    - b. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
    - c. Ground metallic components of pole accessories and foundation.

### **3.16 INSTALLATION OF SURGE PROTECTION FOR ELECTRICAL POWER CIRCUITS**

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install in separate enclosure UL Listed for location and adjacent to main incoming service entrance section.
- D. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- E. Use crimped connectors and splices only. Wire nuts are unacceptable.
- F. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.
- G. Test and Inspections:
  - 1. An SPD will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.
- I. Train Owner's maintenance personnel to operate and maintain SPDs.

### **3.17 INSTALLATION OF POWER EQUIPMENT**

- A. FLOOR- MOUNTED EQUIPMENT CONCRETE PAD: Install switchboards, transformers and enclosed controllers on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
  - 1. Install conduits entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after equipment is anchored in place.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
  - 3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from enclosures and components.
- C. Provide power and control wiring for HVAC, switchboards, panelboards, motor starters and safety switches as shown on the Drawings.
- D. Connections to miscellaneous building equipment:
  - 1. Wire to, and connect to, all items of building equipment not specifically described but to which line-voltage electrical power is required.
  - 2. Coordinate as necessary with other trades and suppliers to verify types, numbers and locations of equipment.

3. Make final connections to all kitchen equipment per manufacturer's instructions.
  4. Mark each pull-box/junction box with a permanent ink marker the panel designation and circuit number contained.
- E. Mounting Heights:
1. Install light switch at 48 inches to center of device above finished floor. Unless otherwise noted.
  2. Install convenience receptacle at 18 inches to center of device above finished floor. Unless otherwise noted.
  3. Install convenience receptacle at 4 inches to center of device, above back splash of countertop. Unless otherwise noted.
  4. Install telephone jack rough in at 18 inches to center of device above finished floor. Unless otherwise noted.
  5. Install telephone jack for side-reach wall telephone, to position top of telephone at 54 inches to center of device, above finished floor. Unless otherwise noted.

### **3.18 MATERIAL AND EQUIPMENT**

- A. All materials and equipment shall be new, of the same type and manufacture, and shall be of the best quality and design and free from defects.
- B. A Manufacturer's nameplate affixed in a conspicuous place will be required on each major component of equipment stating Manufacturer's name, address and catalog number.

### **3.19 MISCELLANEOUS ITEMS**

- A. The Contractor shall provide all miscellaneous items that would normally be required for proper installation of all electrical systems specified herein.
- B. Completed wiring systems shall be free from short circuits. After completion, this Division 26 shall perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.
- C. Complete temperature control wiring rough-in is the responsibility of this Division 26. Coordinate with Division 23 to provide all locations for rough-in box and conduit requirements. Temperature control wiring shall be installed in conduit as specified by Division 23. Final terminations shall be by Division 23 unless system is 110 volts or greater.
- D. Provide all disconnects and safety switches for mechanical and plumbing equipment. Where safety switches serve equipment with multiple motors, switches shall be fused according to the nameplate of the equipment, or the breaker serving the equipment shall be "HACR" type.

### **3.20 CUTTING AND PATCHING**

- A. The Electrical Contractor shall be responsible for cutting all floors, walls, partitions, ceilings or other construction required for proper installation of his Work. No cutting shall be done without prior approval of the Architect and all cutting shall be performed as directed by the Architect. Compacting of soil shall be provided in accordance to Division 2 Work. Concrete and Asphalt Work shall be provided in accordance to Division 2 Work.



- B. The Electrical Contractor shall provide and install fire-safing material in penetrations through fire rated walls, floors, and ceilings in accordance with local codes.

### **3.21 CLEANING AND PLACING IN SERVICE**

- A. Immediately prior to final inspection, the Contractor shall make a final cleanup of dirt and refuse resulting from his Work and shall assist in keeping the premises clean at all times.
- B. Immediately prior to final inspection, the Contractor shall clean all material and equipment installed under this Contract. Dirt, dust, plaster, stains and foreign matter shall be removed from all surfaces. Damaged finishes shall be touched up and restored to their original Condition.
- C. Mechanism of all equipment shall be checked, adjusted and tested for proper operation. Protective devices and parts shall be checked and tested for specified and required application and adjusted as required to produce the intended performance.

### **3.22 ADJUSTMENT AND INSTRUCTION**

- A. Energize all systems, equipment, and fixtures and check for proper operation. Check electrical feeders for proper phasing and balance loads between phases.
- B. Position adjustable light fixtures to meet approval of Architect.

### **3.23 TESTING AND INSPECTIONS**

- A. Make written notice to the Architect/Engineer adequately in advance of each of the following stages of construction:
  - 1. Underground electrical system installation is complete, but not covered.
  - 2. Rough-in installation of electrical systems are complete, but not covered.
  - 3. At final completion of the Work of this Section 260400.
- B. Provide personnel and equipment to perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Acceptance Testing:
    - a. Test insulation resistance for each distribution bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the enclosure and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
    - b. Test continuity of each circuit. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Values shall not deviate more than 50 percent of lowest value tested.
    - c. Test ground-fault protection for service equipment per NFPA 70.
    - d. Use suitable test instrument to measure resistance to ground system. Test in accordance with test instrument manufacturer's specified fall-of potential method.
  - 2. Tests and Inspections:
    - a. Perform each visual, accessible bolted electrical connection, mechanical inspection and electrical test for component type stated in NETA Acceptance Testing Specification including Tables. Certify compliance with test parameters.
    - b. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

- c. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
  - d. Prior to energizing motors, verify voltages are within plus or minus 10 percent of nameplate rated voltages at motor.
  - e. Test each connected motor for proper phase rotation.
- C. When material and/or workmanship is found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance, remove the non-complying items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.

### **3.24 PROJECT COMPLETION**

- A. Upon completion of the Work of this Section, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type cleaner recommended by the Manufacturer of the item being cleaned.
- B. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual required to be submitted under Article 1.05 of this Section of these Specifications. Provide thorough training of personnel required to operate systems installed.

**END OF SECTION**

## **SECTION 31 1000 SITE CLEARING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Protecting existing trees, vegetation to remain.
  - 2. Removing existing trees, vegetation.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Removing above- and below-grade site improvements.
  - 6. Disconnecting, capping or sealing, and removing site utilities.
  - 7. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
  - 1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
  - 2. Division 1 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
  - 3. Division 1 Section "Execution" for verifying utility locations and for recording field measurements.
  - 4. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

#### **1.03 DEFINITIONS**

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

#### **1.04 MATERIAL OWNERSHIP**

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### **1.05 SUBMITTALS**

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

#### **1.06 QUALITY ASSURANCE**

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## **1.07 PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

## **PART 2 PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
  - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### **3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Refer to Stormwater Pollution Prevention Plan.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.03 TREE PROTECTION**

- A. Do not excavate within tree protection zones, unless otherwise indicated.
- B. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

### **3.04 UTILITIES**

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.

### **3.05 CLEARING AND GRUBBING**

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  - 3. Remove rootballs. Remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### **3.06 TOPSOIL STRIPPING**

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Limit height of topsoil stockpiles to 72 inches.
  - 2. Do not stockpile topsoil within tree protection zones.
  - 3. Stockpile surplus topsoil to allow for resspreading deeper topsoil.

### **3.07 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

### **3.08 DISPOSAL**

- A. Disposal: Remove unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

### **END OF SECTION**

**SECTION 31 1100  
STORMWATER POLLUTION PREVENTION PLAN**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Stormwater Pollution Prevention Plan.
- B. Related Sections include the following:
  - 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
  - 2. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

**1.03 QUALITY ASSURANCE**

- A. Perform Work in accordance with Oklahoma Department of Transportation Standard Specifications for Highway Construction and the US Environmental Protection Agency. Maintain one copy on site.

**PART 2 PRODUCTS – NOT APPLICABLE**

**PART 3 EXECUTION**

**3.01 EXECUTION**

- A. Contractor shall review and familiarize themselves with all aspects of the Stormwater Pollution Prevention Plan and perform work accordingly.
- B. Contractor is responsible for submitting the NOI to EPA prior to the start of work.
- C. Contractor shall also submit notice of Termination (NOT) at the completion of job when permanent vegetation covers at least 80% of the disturbed area.

**END OF SECTION**

## **SECTION 31 2000 EARTH MOVING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Preparing subgrades for areas outside the building perimeter.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Subbase and base course for paving.
  - 4. Subsurface drainage backfill for walls and trenches.
  - 5. Excavating and backfilling for utility trenches.
- B. Related Sections include the following:
  - 1. Division 01 Section "Unit Prices" for unit-price rock excavation and authorized additional excavation provisions.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
  - 3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
  - 4. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

#### **1.03 UNIT PRICES**

- A. Unit prices for earthwork are included in Division 01 Section "Unit Prices." Unit price shall include cost for removal of soft materials and replacement of imported structural fill per cubic yard plus a unit price for rock removal per cubic yard.

#### **1.04 DEFINITIONS**

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subgrade and hot-mix asphalt or concrete paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.

- H. Initial Backfill: Fill free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit and as defined by utility trench detail on the plans.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping, or blasting, when permitted:
  - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
  - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.
- L. Utilities: Underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

## **1.05 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Each type of plastic warning tape.
  - 2. Geotextile.
  - 3. Controlled low-strength material, including design mixture.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 698 for each soil material proposed for fill and backfill.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

## **1.06 QUALITY ASSURANCE**

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## **PART 2 PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient on site materials do not match the Geotech report for engineered fill.
- B. Base Course: Naturally graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; conforming to ODOT Type "A" aggregate base.



- C. Engineered Fill:
1. Structural fill within the proposed building and pavement areas shall have the following properties and as specified in the geotechnical report:
    - a. Material having a Plasticity Index (PI) of less than 20
    - b. Material having a Liquid Limit (LL) of less than 40
    - c. Maximum dry density in excess of 100 pounds per cubic foot
    - d. Maximum particle size of 3 inches
    - e. At least 30 percent of the material passing the No. 200 sieve
    - f. Shall be free of any organics
    - g. Prior to any filling operations, samples shall be tested by and approved by the owner's on-site geotechnical engineer.
  2. Portions of the onsite lower plasticity clay soils are suitable for use as structural fill within the proposed building and pavement areas; however, the contractor shall delineate the area with lower plasticity lean clay soils and collect a bulk sample prior to start of placement for moisture-density relationship and soil classification testing to evaluate the suitability for use as fill within proposed building and pavement areas.
  3. Refer to geotechnical report for other uses of onsite materials as fill.
- D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve. Or as defined by the utility trench details.
- E. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- F. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

## **2.02 GEOTEXTILES**

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
  4. Tear Strength: 56 lbf; ASTM D 4533.
  5. Puncture Strength: 56 lbf; ASTM D 4833.
  6. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
  4. Tear Strength: 90 lbf; ASTM D 4533.
  5. Puncture Strength: 90 lbf; ASTM D 4833.
  6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

## **2.03 CONTROLLED LOW-STRENGTH MATERIAL**

- A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:

1. Portland Cement: ASTM C 150, Type I, II or III.
  2. Fly Ash: ASTM C 618, Class C or F.
  3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch nominal maximum aggregate size.
  4. Foaming Agent: ASTM C 869.
  5. Water: ASTM C 94/C 94M.
  6. Air-Entraining Admixture: ASTM C 260.
- B. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495.

## **2.04 ACCESSORIES**

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

### **3.02 DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches by providing adjacent dewatering trenches as required.
  2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
  3. It is anticipated that the groundwater will be perched within existing fill and/or underlying lower plasticity residual lean clay soils. Temporary perimeter drainage ditches, sumps, and pumps will be needed for removal of the perched water from open excavations and for the removal of additional surface rain water.

### **3.03 EXPLOSIVES**

- A. Explosives: No explosives are allowed.

### **3.04 EXCAVATION, GENERAL**

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsuitable soil materials and rock, replace with approved engineered fill materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms other than at footings.
    - b. 12 inches outside of concrete forms at footings.
    - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    - e. 6 inches beneath bottom of concrete slabs on grade.
    - f. 6 inches beneath pipe in trenches.
  - 3. Care should be exercised during excavation/undercut of the soils adjacent to the existing building to avoid possible influence on the existing structure. The bearing materials of the foundation supporting the adjacent building should be protected during excavation.

### **3.05 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: undercut to a level of at least 12 inches below the design bearing elevation. Where fat clays (CH) soils are encountered, remove these soils within 24 inches of the bottom of the footing. After completion of undercutting the footing elevations can be brought back up to design elevation using approved and properly compacted lower plasticity engineered fill, low strength lean concrete or quick set flowable fill.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
  - 3. Fat clay soils under the proposed building and other structures shall be undercut to a level of at least 18 inches below finished subgrade level and replaced with approved lower plasticity structural fill. All proposed building areas shall have a minimum of 18 inches undercut to allow for placement of properly compacted and approved lower plasticity structural fill.
  - 4. Overexcavation of soft clay soils shall extend 8 inches beyond the edges of the footing for each foot of undercut depth.
  - 5. Overexcavation of soft clay soils shall extend at least 5 feet beyond the perimeter of the proposed building footprint, where feasible.

### **3.06 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.07 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

### **3.08 SUBGRADE INSPECTION**

- A. Notify Engineer
- B. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

### **3.09 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated on-site suitable soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.10 BACKFILL**

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, sub-drainage, damp-proofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

### **3.11 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Place and compact initial backfill of , free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- D. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit.
- E. Backfill voids while installing and removing shoring and bracing.
- F. Place and compact final backfill to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- H. Construct clay "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material shall consist of clay compacted at a water content at or above the soils optimum water content. The clay fill shall be placed to completely surround the utility line and be compacted to at least 95% standard proctor density.

### **3.12 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use engineered fill or on-site material.
  - 2. Under walks and pavements, use engineered fill or on-site material
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.
- D. Existing slopes steeper than 5 horizontal to 1 vertical (5:1) and located in fill areas shall be benched prior to fill placement. Benches shall be cut as the fill placement progresses and shall have a maximum bench height of 2 to 3 feet.

### **3.13 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within range of 2 percent above to 2 percent below the material's optimum moisture content, determined in accordance with ASTM D-698, (standard Proctor procedure).
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
  - 3. Both density and moisture requirements shall be met.

### **3.14 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers between 8 and 12 inches in depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 :
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 8 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent and 95 percent for pavement areas.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  - 4. For utility trenches in unpaved areas, compact each layer of initial and final backfill soil material at 85 percent. In paved areas, compact utility trench backfill at 95 percent.

### **3.15 GRADING**

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
  2. Walks and Pavements: minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### **3.16 BASE COURSES**

- A. Place base course on subgrade free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
  1. Where indicated, install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
  2. Shape base course to required crown elevations and cross-slope grades.
  3. Place base course in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  4. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D-698.

### **3.17 DRAINAGE COURSE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  1. Place drainage course in compacted thickness shown on plans in a single layer.
  2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry relative density according to ASTM D 698.

### **3.18 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Contact Engineer for subgrade proofrolling.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Perform Atterberg limits tests on fly ash and cement kiln dust treated fill/backfill materials placed in the building area for the low volume change fill layer at frequency of at least 1 test per 5,000 SF of area with at least 2 test per lift. Intent of Atterberg limits testing is to determine if the soil has been effectively treated.
- F. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
  2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
  3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

- G. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- H. Density and moisture test shall be performed on each lift prior to placement of subsequent lifts.

### **3.19 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion prior to placement of subsequent base course, paving, or foundations above. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove waste material, including unsuitable soil, trash, and debris, and legally dispose of it off Owner's property.
- B. Transport surplus engineered fill to designated storage areas on Owner's property.

**END OF SECTION**

**SECTION 31 2500  
EROSION AND SEDIMENTATION CONTROL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes
  - 1. Installation of temporary and permanent erosion and sedimentation control systems.
  - 2. Installation of temporary and permanent slope protection systems.
- B. Related Sections
  - 1. Section 31 10 00 – Site Clearing
  - 2. Section 31 20 00 – Earth Moving

**1.02 ENVIRONMENTAL REQUIREMENTS**

- A. Protect adjacent properties; any identified endangered or threatened species or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization.

**1.03 REFERENCES**

- A. Oklahoma Department of Transportation, Standard Specifications for Highway Construction, 2019 (including amendments, supplements and special provisions).

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Sediment control devices are specified on the Construction Drawings. Specified items on the Construction Drawings shall comply with Section 221 of the ODOT Standard Specifications.
- B. Rip-Rap as specified on the plans and in Section 31 37 00.
- C. Temporary and permanent outfall structures as specified on the drawings.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Review the drawings and Storm Water Pollution Prevention Plan.
- B. Revise SWPPP as necessary to address potential pollution from site.
- C. Conduct storm water preconstruction meeting with Site Contractor, all ground-disturbing subcontractors, site engineer of record or someone from their office familiar with the site and SWPPP.

**3.02 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION IMPLEMENTATION**

- A. Place erosion and sediment control systems in accordance with the drawings and Storm Water Pollution Prevention Plan or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.
- B. Deficiencies or changes on the drawings or Storm Water Pollution Prevention Plan shall be corrected or implemented as site conditions change. Changes during construction shall be noted in the Storm Water Pollution Prevention Plan and posted on the drawings (Erosion Control Plans).
- C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.
- D. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional



work ordered by Owner or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to the Owner.

- E. Contractor shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.
- F. Unless required within a shorter timeframe by the applicable General Permit for Storm Water Discharges Associated with Construction Activity, disturbed areas that will not be graded or actively worked for a period of 14 days or more, shall be temporarily stabilized as work progresses with vegetation or other acceptable means. In the event it is not practical to seed areas, slopes must be stabilized with mulch and tackifier, bonded fiber matrix, netting, blankets or other means to reduce the erosive potential of the area.

**END OF SECTION**

**SECTION 31 3116  
TERMITE CONTROL**

**<<<< UPDATE NOTES**

**PART 1 GENERAL**

**2.01 SECTION INCLUDES**

- A. Chemical soil treatment.

**2.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

**2.03 REFERENCE STANDARDS**

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act 2019.

**2.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

**PART 2 PRODUCTS**

**3.01 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
  - 2. FMC Professional Solutions:
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- D. Mixes: Mix toxicant to manufacturer's instructions.

**PART 3 EXECUTION**

**4.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

**4.02 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 extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- D. Re-treat disturbed treated soil with same toxicant as original treatment.
- E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

**END OF SECTION**

## **SECTION 32 1313 CONCRETE PAVING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.02 SUMMARY**

- A. This Section includes exterior cement concrete pavement for the following:
  - 1. Curbs and gutters.
  - 2. Walkways.
  - 3. Ramps and steps.
  - 4. Drives and roadways
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
  - 2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
  - 3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

#### **1.03 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

#### **1.04 SUBMITTALS**

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For manufacturer.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
  - 1. Cementitious materials.
  - 2. Steel reinforcement and reinforcement accessories.
  - 3. Fiber reinforcement.
  - 4. Admixtures.
  - 5. Curing compounds.
  - 6. Applied finish materials.
  - 7. Bonding agent or epoxy adhesive.
  - 8. Joint fillers.
- F. Minutes of preinstallation conference.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

## **1.06 PROJECT CONDITIONS**

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## **PART 2 PRODUCTS**

### **2.01 FORMS**

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. 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.

### **2.02 STEEL REINFORCEMENT**

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- H. Plain Steel Wire: ASTM A 82.
- I. Deformed-Steel Wire: ASTM A 496.
- J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed.
- K. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- L. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.
- M. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- O. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.
- P. Zinc Repair Material: ASTM A 780.

### **2.03 CONCRETE MATERIALS**

- A. Cementitious Material: Use one of cementitious materials, of the same type, brand, and source throughout the Project:
  1. Portland Cement
- B. Normal-Weight Aggregates: ASTM C 33, Class coarse aggregate, uniformly graded. Conform to ODOT specifications for highway construction. Provide aggregates from a single source.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures as allowed by ODOT specifications for highway construction.
- F. Calcium chloride shall not be permitted in concrete mixtures.

### **2.04 CURING MATERIALS**

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
  1. Products: Conform to ODOT.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
  1. Products: Conform to ODOT.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
  1. Products: Conform to ODOT.

### **2.05 RELATED MATERIALS**

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
  1. Color: As indicated by manufacturer's designation Match Architect's sample As selected by Architect from manufacturer's full range.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
  1. Types I and II, non-load bearing IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- E. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
  - 1. Products: Conform to ODOT.

## **2.06 PAVEMENT MARKINGS**

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952E, Type II, with drying time of less than 45 minutes.
  - 1. Color: As indicated.

## **2.07 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete to conform to ODOT specifications for highway construction for properties.
  - 1. Compressive Strength (28 Days): 4,000 psi Maximum Water-Cementitious Materials
  - 2. Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
  - 1. Air Content: 5 to 7 percent
- D. Chemical Admixtures: Conform to ODOT specifications for highway construction.
  - 1. Use water-reducing admixture high-range, water-reducing admixture high-range, water-reducing and retarding admixture plasticizing and retarding admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Conform to the ODOT specifications for highway construction Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
  - 1. Fly Ash or Pozzolan: 25 percent.
  - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

## **2.08 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete mixes larger than 1 cu. yd, increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
  1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 50 tons.
  3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/4 inch require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

### **3.02 PREPARATION**

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Precautions to protect fresh concrete from developing plastic shrinkage cracks must be taken in advance of concrete placement when evaporation rate due to any combination of temperature, humidity, and wind velocity is expected to approach 0.2 lb./sq. ft./hr. as determined by Figure 2.1.5 of ACI 305. Acceptable precautions to reduce the rate of evaporation include use of wind breaks, monomolecular film evaporation retarders, fog spray, covering with polyethylene sheeting, or wet cover.

### **3.03 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### **3.04 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- F. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

### 3.05 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  - 2. Provide tie bars at sides of pavement strips where indicated.
  - 3. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade (within 12 hours of concrete pour), or otherwise damage surface and before developing random contraction cracks.
  - 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated and at construction joints. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### 3.06 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.



- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Place top layer of concrete, strike off, and screed.
  - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- I. Screed pavement surfaces with a straightedge and strike off.
- J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- L. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### **3.07 FLOAT FINISHING**

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
  2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
  3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

### **3.08 CONCRETE PROTECTION AND CURING**

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### **3.09 PAVEMENT TOLERANCES**

- A. Comply with tolerances of ACI 117 and as follows:
  1. Elevation: 1/4 inch .
  2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch.
  4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

### **3.10 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 21 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

### **3.11 FIELD QUALITY CONTROL**

- A. Testing Agency: a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.12 REPAIRS AND PROTECTION**

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION**

**SECTION 32 3113  
CHAIN LINK FENCES AND GATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Posts, rails, and frames.
- B. Wire fabric.
- C. Concrete.
- D. Manual gates with related hardware.
- E. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete anchorage for posts.

**1.03 REFERENCE STANDARDS**

- A. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire 2022.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric 2011a (Reapproved 2022).
- D. ASTM F567 - Standard Practice for Installation of Chain-Link Fence 2014a (Reapproved 2019).
- E. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric 2017 (Reapproved 2022).
- F. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework 2018 (Reapproved 2022).
- G. ASTM F1665 - Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used with Chain-Link Fence 2008 (Reapproved 2022).
- H. CLFMI CLF-PM0610 - Product Manual 2017.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

**1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Posts, Rails, and Frames:
  - 1. ASTM A1011/A1011M Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating conforming to ASTM F1043 and ASTM F1083.
  - 2. Line Posts: Type I round.
  - 3. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round.
- B. Wire Fabric:
  - 1. ASTM F668 polymer-coated steel chain link fabric. Black.
  - 2. Conform to CLFMI CLF-PM0610.
- C. Concrete:
  - 1. Type specified in Section 03 3000.

## **2.02 COMPONENTS**

- A. Line Posts: 1.9 inch diameter.
- B. Corner and Terminal Posts: 2.38 inch diameter.
- C. Gate Posts: 3-1/2 inch diameter.
- D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
- E. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.
- F. Gate Frame: 1.66 inch diameter for welded fabrication.
- G. Fabric: 2 inch diamond mesh interwoven wire, 6 gage, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
- H. Tension Wire: 6 gage, 0.1920 inch thick steel, single strand.

## **2.03 MANUAL GATES AND RELATED HARDWARE**

- A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.
- B. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.
- C. Hinges: Finished to match fence components.
  - 1. Brackets: Round.
  - 2. Mounting: Center.
  - 3. Closing: Manual.
- D. Latches: Finished to match fence components.
  - 1. Brackets: Round.
  - 2. Locking: Mechanical.

## **2.04 ACCESSORIES**

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on outside of posts and rails.
- C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- D. Line Post Footing Depth Below Finish Grade: ASTM F567.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.
- F. Do not stretch fabric until concrete foundation has cured 28 days.
- G. Position bottom of fabric 1 inch above finished grade.
- H. Install hardware and gate with fabric to match fence.
- I. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

### **3.02 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

**END OF SECTION**

**SECTION 33 4100  
STORM DRAINAGE UTILITY PIPING**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes gravity-flow, nonpressure storm drainage outside the building, with the following components:
  - 1. Drains & pipes.
  - 2. Storm Inlets
  - 3. Precast concrete manholes.
  - 4. Concrete headwalls

**1.03 DEFINITIONS**

- A. EPDM: Ethylene-propylene-diene-monomer rubber.
- B. LLPE: Linear low-density, polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. TPE: Thermoplastic elastomer.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silt tight, unless otherwise indicated.

**1.05 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Catch Basins
  - 2. Pipe and fittings
  - 3. Manholes
  - 4. Stormwater Inlets
  - 5. ODOT concrete end sections
- B. Shop Drawings: For the following:
  - 1. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.
- C. Field quality-control test reports.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes, catch basins, and stormwater inlets according to manufacturer's written rigging instructions.

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

**2.02 PE PIPE AND FITTINGS**



- A. Corrugated PE Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
  - 1. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 48: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  - 1. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
- C. Corrugated PE Pipe and Fittings NPS 56 and NPS 60: AASHTO MP7, Type S, with smooth waterway for coupling joints.
  - 1. Silt tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

### **2.03 PVC PIPE AND FITTINGS**

- A. PVC Water-Service Pipe and Fittings: ASTM D 1785, Schedule 40 pipe, with plain ends for solvent-cemented joints with ASTM D 2466, Schedule 40, socket-type fittings.
- B. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) and Smaller: ASTM D 3034, SDR 35 with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- C. PVC Sewer Pipe and Fittings, NPS 18 (DN 450) and Larger: ASTM F 679, T-[1] [2] wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- D. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794 pipe, with bell-and-spigot ends; ASTM D 3034 fittings, with bell ends; and ASTM F 477, elastomeric seals.

### **2.04 CONCRETE PIPE AND FITTINGS**

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, with bell-and-spigot or groove and tongue ends.
  - 1. Gasketed joints with ASTM C 443, rubber gaskets, "omni-flex" or equal
  - 2. Class III, Wall A.

### **2.05 NONPRESSURE-TYPE PIPE COUPLINGS**

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

### **2.06 CLEANOUTS**

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
  - 1. Top-Loading Classification(s): Extra-heavy duty.
  - 2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

### **2.07 DRAINS**

- A. As specified on plans, or equivalent.

### **2.08 MANHOLES**

- A. Standard Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 1. Diameter: 48 inches minimum, unless otherwise indicated.
  - 2. Base Section: 8-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  - 3. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.

4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
7. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
8. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
10. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

## **2.09 MANHOLES**

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
  1. Cement: ASTM C 150, Type II.
  2. Fine Aggregate: ASTM C 33, sand.
  3. Coarse Aggregate: ASTM C 33, crushed gravel.
  4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
  1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
  2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

## **2.10 CATCH BASINS**

- A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
  3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
  7. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
  8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.
3. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.

## **2.11 EARTHWORK**

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

## **2.12 PIPING INSTALLATION**

- A. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

## **2.13 PIPE JOINT CONSTRUCTION**

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

## **2.14 CATCH BASIN INSTALLATION**

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

## **2.15 CONCRETE PLACEMENT**

- A. Place cast-in-place concrete according to ACI 318/318R.

## **2.16 DRAINAGE SYSTEM INSTALLATION**

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch (102-mm) minimum concrete around bottom and sides.
- E. Fasten grates to channel sections if indicated.
- F. Assemble channel sections with flanged or interlocking joints.
- G. Embed channel sections in 4-inch (102-mm) minimum concrete around bottom and sides.

## **2.17 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  1. Submit separate reports for each system inspection.
  2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Re-inspect and repeat procedure until results are satisfactory.

## **2.18 CLEANING**

- A. Clean interior of piping of dirt and superfluous materials.

## **PART 3 EXECUTION**

### **3.01 EARTHWORK**

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

### **3.02 PIPING APPLICATIONS**

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
    - a. Shielded flexible couplings for same or minor difference OD pipes.
    - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
  - 2. Use pressure-type pipe couplings for force-main joints.
- B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

### **3.03 PIPING INSTALLATION**

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 3. Install piping with 36-inch minimum cover.
  - 4. Install piping below frost line.
  - 5. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
  - 6. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

### **3.04 PIPE JOINT CONSTRUCTION**

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:
  1. Join corrugated PE piping according to CPPA 100 and the following:
    - a. Use silt tight couplings for Type 1, silt tight joints.
  2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
  3. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
  4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints and proper tolerances for the Omni-flex gaskets.
  5. Join dissimilar pipe materials with nonpressure-type flexible couplings.
- C. Join dissimilar pipe materials with pressure-type couplings.

### **3.05 CLEANOUT INSTALLATION**

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
  2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
  3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
  4. Use extra-heavy-duty, top-loading classification cleanouts in roads areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

### **3.06 DRAIN INSTALLATION**

- A. Install type of drains in locations indicated.
  1. Use light-duty, top-loading classification drains in earth or unpaved foot-traffic areas.
  2. Use medium-duty, top-loading classification drains in paved foot-traffic areas.
  3. Use heavy-duty, top-loading classification drains in vehicle-traffic service areas.
  4. Use extra-heavy-duty, top-loading classification drains in roads areas.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

### **3.07 MANHOLE INSTALLATION**

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.
- E. Install FRP manholes according to manufacturer's written instructions.
- F. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

### **3.08 CATCH BASIN INSTALLATION**

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

### **3.09 STORMWATER INLET AND OUTLET INSTALLATION**

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

### **3.10 CONCRETE PLACEMENT**

- A. Place cast-in-place concrete according to ACI 318/318R.

### **3.11 STORMWATER DISPOSAL SYSTEM INSTALLATION**

- A. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill according to piping manufacturer's written instructions.

### **3.12 CONNECTIONS**

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
  - 1. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- B. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

### **3.13 IDENTIFICATION**

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
  - 1. Use warning tape over piping and over edges of underground structures.

### **3.14 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
  - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
  - b. Option: Test plastic piping according to ASTM F 1417.
  - c. Option: Test concrete piping according to ASTM C 924.
  - d. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
  - e. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### **3.15 CLEANING**

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water as required.

**END OF SECTION**