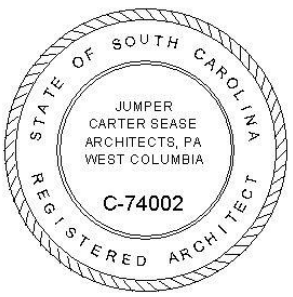
PROJECT MANUAL
VOLUME 1

SPRINGFIELD MIDDLE SCHOOL – COOLER/FREEZER ENCLOSURE

FORT MILL SCHOOL DISTRICT
FORT MILL, SOUTH CAROLINA

JCS Commission No. 22004

January, 2023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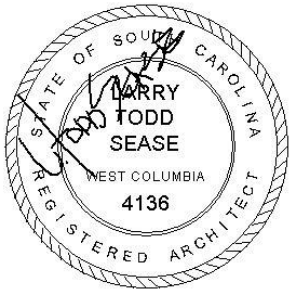
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LARRY
TODD
SEASE
WEST COLUMBIA
4136
REGISTERED ARCHITECT


SOUTH CAROLINA
SIMS GROUP
ENGINEERS, INC.
No. C03104
CERTIFICATE OF AUTHORIZATION


SOUTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
No. 18744
02/27/2023
CHRIS PARTRICH


SOUTH CAROLINA
SWYGERT AND
ASSOCIATES,
LTD.
NO. C00227
CERTIFICATE OF AUTHORIZATION


SOUTH CAROLINA
PROFESSIONAL ENGINEER
No. 23877
2-28-23
BRADLEY J. JASINSKI


SOUTH CAROLINA
SWYGERT AND
ASSOCIATES,
LTD.
NO. C00227
CERTIFICATE OF AUTHORIZATION


SOUTH CAROLINA
PROFESSIONAL ENGINEER
No. 15574
2-28-23
TODD F. SWYGERT

VOLUME 1

VOLUME 2

END OF SECTION

PART 1 - GENERAL

1.1 Related Documents

1.1.1 Documents affecting work of this section include, but are not necessarily limited to, the contract documents, addenda and General and Supplementary Conditions.

1.2 Products Lists

1.2.1 Within the bidding period for non-specified manufacturers of items specified by reference standards, submit to Architect/Engineer five (5) copies of complete list of major products, which are proposed for installation.

1.2.2 Tabulate products by specifications' section number and title.

1.2.3 For products only by reference standards, list for each product:

A. Name and address of manufacturer

B. Trade name

C. Model or catalog designation

D. Manufacturer's data:
1) Reference standards
2) Performance test data

1.3 Contractor's Options

1.3.1 For products specified only by reference standard, select product meeting that standard by any manufacturer.

1.3.2 For products specified by naming several products or manufacturers, select any one of the products and manufacturers named which complies with the specifications.

1.3.3 For products specified by naming several products or manufacturers and stating "or equivalent", "or equal," or "or approved equal" submit a request as for substitutions, for any product or manufacturer which is not specifically named.

1.4 Substitutions

1.4.1 Contractor's Base Bid shall be in strict accordance with the drawings and project manual. Contractor has the option of requesting substitutions during the bidding period by submitting completed substitution requests a minimum of ten (10) days prior to Bid Date.

A. After end of that period, requests will be considered only in case of product unavailability or other conditions beyond the control of the Contractor.

1.4.2 Submit separate requests for each substitution. Support each request with the following:

A. Complete data substantiating compliance of proposed substitution with requirements stated in contract documents:

1) Product identification, including the manufacturer's name and address.
2) Manufacturer's literature; identify:
   a. Product description
   b. Reference standards
   c. Performance and test data
3) Samples, as applicable.
4) Name and address of similar projects on which product has been used, and date of each installation.

B. Itemized comparison of the proposed substitution with product specified; list significant variations.

C. Data relating to changes in construction schedule.

D. Any effect of substitution on separate contracts.

E. List of changes required in other work or products.

F. Designation of required license fees or royalties.

G. Designation of availability of maintenance services, sources of replacement materials.

1.4.3 Substitutions will not be considered for acceptance when:

A. They are indicated or implied on shop drawings or product data submittals without formal request from Contractor.

B. Acceptance will require substantial revision of contract documents.

C. In the judgment of Architect/Engineer, do not include adequate information necessary for a complete evaluation.

D. If requested after contract award directly by a trade Contractor, sub-contractor or supplier.

1.4.4 Substitute products shall not be ordered or installed without written acceptance of Architect/Engineer.

1.4.5 Architect/Engineer will determine acceptability of proposed substitutions.

1.5 Contractor's Representation

1.5.1 In making formal request for substitution, Contractor represents the following:

A. He has investigated the proposed product and has determined that it is equivalent to or superior in all respects to that specified.

B. He will provide same warranties or bonds for substitution as for product specified.

C. He will coordinate installation of accepted substitution into the work, and make such changes as may be required for the work to be complete in all respects.

D. He waives claims for additional costs caused by substitution, which may subsequently become apparent.

1.6 Architect/Engineer Duties

1.6.1 Review Contractor's request for substitutions with reasonable promptness.

1.6.2 Notification to Contractor shall be in accordance with contract documents.

1.7 Substitution Request Form

1.7.1 See Section 00 43 25 for Substitution Request Form.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO:

PROJECT: **SPRINGFIELD MIDDLE SCHOOL – COOLER/FREEZER ENCLOSURE**

We hereby submit for your consideration the following product instead of the specified item for the above project:

Drawing	Spec. Sect. No.	Paragraph	Specified Item
_____	_____	_____	_____

Proposed Substitution:

Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Submit with request all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

Fill in blanks below:

A. Does the substitution affect dimensions shown on the Drawings?

Yes____ No ____

If yes, clearly indicate the changes:

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes ___ No ___

C. What effect does substitution have on other Contracts or other Trades?

D. What effect does substitution have on construction schedule?

E. Manufacturer's warranties of the proposed and specified items are:

Same _____ Different _____(Explain on attachment.)

F. Reason for request:

G. Itemized comparison of specified item(s) with the proposed substitution; list significant variations:

H. Accurate cost date comparing proposed substitution with product specified:

I. Designation of maintenance services and sources:
(Attach additional sheets if required)

CERTIFICATE OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

_____
Signature Title

_____
Firm

_____
Address

_____
Telephone Date

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in rejection of proposed substitution.

For Use By Architect:

____Accepted ____Accepted as Noted

____Not Accepted ____Received Too Late

By:_____

Date:_____

Remarks:_____

_____

_____

_____

_____

_____

_____

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: To enable orderly review during progress of the Work, and to provide for systematic discussion of problems and to coordinate all phases of the Project toward completion in accordance with the Contract Documents, the Construction Manager will conduct project meetings throughout the construction period.

B. Related Work:

1. Documents affecting work of this section include, but are not necessarily limited to, the contract documents, addenda and General and Supplementary Conditions.

2. The Contractor's relations with his subcontractors and materials suppliers are the Contractor's responsibility and normally are not part of project meeting content.

3. This Section specifies administrative and procedural requirements for project meetings including, but not limited to:

a. Pre-construction conferences.
b. Progress meetings.
c. Coordination meetings.
d. Pre-installation conferences.

1.2 QUALITY ASSURANCE

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings. Any change in personnel by a Contractor will be forwarded in writing to the Construction Manager prior to the change.

1.3 SUBMITTALS

A. Agenda Items: To the maximum extent practical, advise the Construction Manager at least 24 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:

1. The Construction Manager will compile minutes of each project meeting, and will furnish one copy to the Prime Contractors, Architect and required copies to the Owner.

2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS

(No products are required in this Section)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

A. Except as noted for Pre-construction Meeting, formal job site meetings with on site job superintendents will be held weekly.

B. Except as noted for Pre-construction Meeting, formal project meetings with attendance of each Contractor's office Project Manager will be held monthly.

C. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

A. The Construction Manager will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.3 PRE-CONSTRUCTION MEETING

A. Pre-construction Meeting will be scheduled to be held within 15 working days after the Owner has issued the Notice to Proceed.

1. Provide attendance by authorized representatives of the Contractor.

2. The Construction Manager will advise other interested parties, including the Owner, and request their attendance, as necessary.

B. Minimum Agenda: Data will be distributed and discussed on at least the following items:

1. Organizational arrangement of Contractor's forces and personnel, subcontractors, material suppliers, the Construction Manager, and the Architect.

2. Channels and procedures for communication.

3. Construction schedule, including sequence of critical work.

4. Contract Documents, including distribution of required copies of original Documents and revisions.

5. Processing of Shop Drawings and other data submitted to the Construction Manager for transmittal to Architect for review.

6. Processing of Bulletins, field decisions, Change Orders, and Payment Applications.

7. Rules and regulations governing performance of the Work.

8. Procedures for safety and first aid, security, quality control, housekeeping and related matters.

9. Preparation of record drawings.

10. Use of the premises.

11. Office, work and storage areas.

12. Equipment deliveries and priorities.

13. Working hours.

14. Request for Information format.

15. Notification of Defective and Non-Conforming Work format.

16. Rejection of Work format.

3.4 PROJECT MEETINGS

A. Attendance:

1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.

2. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

3. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at the meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

B. Minimum Agenda:

1. Review, revise as necessary, and approve minutes of previous meetings.

2. Review progress of the Work since last meeting, including status of submittals for approval. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.

3. Identify problems which impede planned progress.

4. Develop corrective measures and procedures to regain planned schedule.

5. Complete other current business.

6. Update as-built documents as required.

7. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

8. Review the present and future needs of each entity present, including such items as:

a. Interface requirements.
b. Time.
c. Sequences.
d. Deliveries
e. Off-site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
I. Hours of work.
j. Hazards and risks.
k. Cleaning and site conditions.
l. Quality and work standards.
m. Change Orders.

n. Documentation of information for payment requests.

C. Revisions to minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.

2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.

3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

D. Reporting: No later than 5 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

END OF SECTION

PART 1 GENERAL

A. The Contractor shall submit for review by the Architect/Engineer, Shop Drawings and schedules required by the Specifications, or that may be requested by the Architect/Engineer, and no work shall be fabricated by the Contractor, except at his own risk, until such review has been completed.

1.1 FORM OF SUBMISSION MATERIALS

A. SHOP DRAWING SCHEDULE

1. Immediately after date of Notice to Proceed, each Contractor shall submit to the Construction Manager a Shop Drawing Submittal Schedule, which shall include the following minimum information (**This should be provided at the Pre-Construction Meeting):**

a. List all items to be submitted for review referenced to the specific specifications section.

b. Name of subcontractor if applicable.

c. Supplier and date of purchase order.

d. Total fabrication and delivery time from time submittals are returned to the Contractor.

e. Scheduled delivery date.

(NOTE): No applications for payment will be processed unless the above listed information has been submitted.

B. SHOP DRAWINGS

1. Scale and Measurements: Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.

2. Types of submittals required:

a. Submit Shop Drawings in the form of six prints of each sheet.

b. Submit six copies of all supporting documentation including manufacturer's data, installation requirements, dimensional information, and any other required information to determine if a product meets the intent of the specification.

3. Review comments of the Architect will be made to all copies when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purposes.

C. MANUFACTURER'S LITERATURE

1. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

D. SAMPLES

1. Provide Sample or Samples identical to the precise article proposed to be provided. Identify as described under "Identification of Submittals" below.

2. Number of Samples required:

a. Unless otherwise specified, submit samples in the quantity which is required to be returned, plus three which will be retained by the Architect and Construction Manager.

b. By prearrangement in specific cases, a single sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Architect.

E. COLORS AND PATTERNS

1. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.

1.2 SUBMISSION PROCEDURE

A. IDENTIFICATION OF SUBMITTALS

1. Multiple submittals on a single transmittal are not acceptable. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

2. All submittals will be consecutively numbered.

a. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.

b. On re-submittals, cite the original submittal number for reference.

3. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

4. Maintain an accurate submittal log for duration of the Work, showing current status of all submittals at all times. Make the submittal log available to the Architect and Construction Manager for their review, upon request.

B. GROUPING OF SUBMITTALS

1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

a. Partial submittals will be rejected as not complying with the provisions of the Contract.

b. The Contractor may be held liable for delays so occasioned.

2. Provide a separate transmittal and drawing number for each item to be reviewed.

C. CHECKING SUBMITTALS PRIOR TO SUBMISSION

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item and the submittal for it conform in all respects with the specified requirements.

3. The drawings submitted shall be marked with the name of the project, numbered consecutively and bear the signed and dated stamp of the approval of that Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for re-submission. If the shop drawings show variation from the requirements of the Contract because of standard shop practice or with reasons, the Contractor shall make specific mention of such variations in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment; otherwise, that Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though such shop drawings have been approved.

D. DELIVERY AND TIMING OF SUBMITTALS

1. All submittals shall be transmitted to the Construction Manager for forwarding to the Architect/Engineer for review based upon their relative position in the Construction Schedule, or as follows:

a. Prior to Mobilizing On-Site
   1. Bonds
   2. Insurance Certificate

b. Following Notice to Proceed; **NOTE TIME FRAMES INVOLVED**
   1. Shop Drawing Submittal Schedule (within 10 days)
   2. Schedule of Values (within 10 days)
   3. Superintendent's Resume (within 10 days)
   4. Detailed Construction Schedule (within 10 days) updated monthly
   5. Subcontractor Listing (within 10 days) updated monthly
   6. All Shop Drawings/Submittals (within 3 months) unless otherwise approved

2. Shop drawing submittals shall be made far enough in advance, based on the approved Construction Schedule, to meet all installation dates as scheduled. This will require that sufficient lead time be allowed to address an adequate review period, securing necessary approvals, possible revisions and re-submittals, placing orders and securing delivery dates.

3. In scheduling, allow at least ten (10) working days for review by the Architect following his receipt of the submittal (plus transit time).

E. ARCHITECT'S REVIEW

1. Review by the Architect does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

2. The review of Shop Drawings will be general and shall not be construed as:
   a. Permitting any departure from the Contract Requirements.

   b. Relieving the Contractor of the responsibility for any error in details, dimensions or otherwise that may exist.

   c. Approving departures from additional details or instruction previously furnished by the Architect/Engineer.

3. Revisions:

   a. Make revisions required by the Architect.

   b. If the Contractor considers any required revisions to be a change, he shall notify the Construction Manager and/or Architect as provided for in Specification Section 01 26 53.

   c. Make only those revisions directed or approved by the Architect.

4. If a drawing, as submitted, indicates a departure from the Contract requirements which the Architect/Engineer finds to be in the interest of the Owner and to be minor as not to involve a change in the Contract Price or time for performance, the Architect/Engineer may approve the drawing.

F. FINAL DISTRIBUTION OF SUBMITTALS

1. The Construction Manager will retain one set at the project site. Each Contractor shall be responsible for the distribution of the Shop Drawings and schedules within his own organization and to his subcontractors.

END OF SECTION

ELECTRONIC FILE AGREEMENT

PROJECT NAME: SPRINGFIELD MIDDLE SCHOOL
COOLER/FREEZER ENCLOSURE

JCS COMMISSION NUMBER: 22004

DATE OF AGREEMENT:

ELECTRONIC FILES TO BE TRANSMITTED:

DELIVERED VIA: email

At your request, Jumper Carter Sease/Architects PA (JCS) will provide electronic files for your convenience and use related to the project noted subject to the following terms and conditions. By your signature you agree to these terms and conditions.

1. JCS files are compatible with the software version they were created in. JCS makes no representation as to the compatibility of these files with other hardware or software used.
2. Data contained within the electronic files are part of JCS's instruments of service and shall not be used by anyone receiving this data for purposes other than as a convenience in the preparation of work for the subject project. Any other use or reuse is strictly forbidden.
3. Purchaser agrees to indemnify and hold harmless JCS from all claims, damages, losses and expenses, including attorney's fees, arising from the use of the subject files.
4. The electronic files are not contract documents. By use of the electronic files, purchaser is responsible for complying with the contract documents including but not limited to the need to check, confirm and coordinate all dimensions and details, field measurements, verification of field conditions and coordination of work with others.
5. The Architect's title block or other information identifying the Architect or the Architect's professional consultants will not be provided on the electronic files and this agreement grants no right to reproduce or otherwise utilize such information.
6. JCS may require a service/handling fee prior to delivery of the requested electronic files.
7. Under no circumstances shall delivery of the electronic files for use be deemed a sale by JCS, and JCS makes no warranties, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall JCS be liable for any loss of profit or any damages. Purchaser acknowledges and assumes all such risks.
8. Electronic files are in AutoCAD 2013 format.

ELECTRONIC FILE AGREEMENT

PROJECT NAME: SPRINGFIELD MIDDLE SCHOOL – COOLER/FREEZER ENCLOSURE

JCS COMMISSION NUMBER: **22004**

Item	Sheet Name	Drawing Number

IN WITNESS WHEREOF, THE Engineer and Purchaser have caused this Agreement to be executed by their duly authorized representatives, as of the date set forth above.

ARCHITECT: **Jumper Carter Sease/Architects, P.A.**

By: _____

Title: _____

Date: _____

Email: _____

Signature: _____

PURCHASER: _____

By (print name): _____

Title: _____

Date: _____

Email: _____

Signature: _____

Make checks payable to "Jumper Carter Sease/Architects PA." The service/handling fee for the files is Two Hundred Fifty Dollars, ($250.00).

Signed electronic file agreement and check can be mailed to:

Jumper Carter Sease, PA
412 Meeting Street
West Columbia, South Carolina 29169

Electronic files are available for the above project. The files will be either emailed or burned on a CD depending on the contractor's preference. **NO FILES WILL BE TRANSFERRED WITHOUT FIRST** receiving a signed copy of the electronic file agreement and a check or cash money for the full amount shown on the electronic file agreement.

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. See Divisions 2 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as

"carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Construction Manager for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Construction Manager for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and re-inspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee

payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. 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 installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Construction Manager, with copy to Contractor. Interpret

tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Construction Manager.
   2. Notify Construction Manager seven days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Construction Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
2. Do not install finishes until required inspection of concealed construction is completed and work approved.
a. Coordinate in-wall and above-ceiling inspection by authorities having jurisdiction and observation by Architect.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Construction Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Construction Manager’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. This Section includes administration and procedural requirements for compliance with the 2021 IBC, Chapter 1 Inspections and Chapter 17 Special Inspections.

C. South Carolina Office of School Facilities (OSF) – “INSPECTION PROGRAM MANUAL”, latest edition.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Pre-construction Conference: Upon receipt of the “Notice-to-Proceed” and prior to the start of construction, the contractor shall conduct a Pre-construction Conference. It is the responsibility if the construction manager to notify the architect of the date and time of this conference in a timely manner so that the architect can notify the Office of School Facilities (OSF). A representative from OSF along with representatives from the testing company(ies) and the Chapter 1 and Chapter 17 inspection agencies must be present.

D. Related Sections include the following:
1. Division 1 Section "Construction Progress Schedule" for developing a schedule of required tests and inspections. The special inspector shall continually coordinate with the construction manager for the time and requirements of required inspections.
2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 2 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Agency Approval: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by South Carolina Office of School Facilities (OSF).

B. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

D. Delete first paragraph below if Project does not require mockups. Revise if any mockups are to be constructed at an off-site location.

E. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

F. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

G. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

H. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

I. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

J. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

K. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

L. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

M. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with

special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

D. Where conflict exists between the construction documents and approved shop drawings submittal data, the construction documents shall govern unless the shop drawing/submittal data are more restrictive. All conflicts shall be brought to the attention of the architect.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Recognized Agency: For the purposes of this work, only companies utilizing **certified inspectors as designated by the South Carolina Office of School Facilities** will be accepted for these special inspections. These Companies are listed on their web site however may not be current. Documentation of the individual's certificates scheduled to perform inspections for this project must be submitted for review by the architect prior to award of this work.

C. Special Inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to OSF, contractor, architect and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of OSF and to the architect prior to the completion of the phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and OSF. Prior to the start of work.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.

6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports that include, but are not limited to, the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

Sample forms required for use by OSF are indicated in section 3.4 Testing and Inspection Log and Forms located toward the end of this specification.

F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. 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 installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect through the Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven (7) days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 33.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least Forty Eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
6. The contractor shall be responsible for costs of: Re-testing and re-inspection of materials, work and/or products that do not meet requirements of the construction documents and shop drawings/submittal data.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with the Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for commencement of the Work the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Shall be as listed herein.

B. Special Tests and Inspections: Conducted by a qualified **special inspector designated by the South Carolina Office of School Facilities (OSF)** as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES
Acceptable companies shall be as designated by the South Carolina Office of School Facilities (OSF).

3.2 SPECIAL INSPECTIONS REQUIRED CHAPTER 17:

A. Seismic Design Category: The Seismic Design Category for this project is "**C**".

B. Facility Classification: As stated in Section 1604.5 of the 2021 IBC, this facility is classified as a "Non-Essential Facility".

C. IBC 2021 Chapter 17 Inspections, INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:

2021 IBC Chapter 17 Statement of Special Inspections SPRINGFIELD MIDDLE SCHOOL – COOLER/FREEZER ENCLOSURE- Fort Mill School District –York 4							
Material/Activity	Type of Inspection	Req'd For Proj.	Ref. IBC Section or Specs	Inspection /Testing By:			
				A/E	Owner's Special Insp	Owner's Test Lab	Contractor / Supplier
SPECIAL INSPECTIONS							
Seismic	Seismic Systems Seismic force resisting systems	X	1705.11 1705.12		X		
Wind	Wind Requirements	X	1705.10		X		
Structural Observation:							
Seismic	Seismic Design D,E,or F and Risk Category III		1704.5.2 1705.11.4			Seismic	
Wind	V_{asd} per 1609.3.1 exceeds 110 mph and Category III	X	1704.5.2		X	Wind	
Foundations:							
Soil	Compaction of Fill Ma-	X	Specs.				

	terials		1705.6			X	
Soil	Bearing at Bottom of Footing Excavations	X	Specs			X	
Reinf. Bars	Size and Placement in Foundations	X	ACI, Specs	5	X		X
Concrete Construction:							
Concrete	Ready-mix Plant Quality Control	X	Specs	2			X, 1
Concrete	Mix Design Test and Certificates	X	Specs, 1705.3.1	X			X, 1
Reinf. Steel	Shop Drawings or Reinforcing Steel	X	Specs	X			X,1
Reinf. Steel	Placement of Reinforcing Steel	X	TABLE 1705.3	5	X		
Reinf. Steel	Welding	X	TABLE 1705.3	2	X		X,1
Formwork	Design, Placement, & Shoring	X	TABLE 1705.3		X		X
Formwork	Removal and Reshoring	X	TABLE 1705.3				X
Concrete	Test Cylinders	X	TABLE 1705.3	4		X	
Concrete	Mix proportions & Mix on Delivery Tickets	X	TABLE 1705.3 AND SPECS			X	
Concrete	Slump Test	X	1 TABLE 1705.3 AND SPECS	4		X	X
Concrete	Placement Procedures	X	*1905.9, 1905.10*	5	X		
Concrete	Curing Temperatures & techniques	X	1905.11		X		
Anchors	Anchors cast in concrete				X		
MASONRY CONSTRUCTION:							
Inspection Level	Indicate level of Inspection Required	X	Table 1705.6		X		
Quality Assurance	Indicate level of Quality Assurance Required	X	1705.4		X		
Clay Masonry	Certificate, Tests & Technical Data	X	1705.4,	X			3
Foundations Elements	Quality assurance	X	1705.4	5	X		
Masonry	Placement of units, mortar & accessories	X	1705.4	5	X		
Masonry	Protection of masonry work	X	1705.4	5	X		
Anchorage	Placement of devices	X	1705.4	5	X		
Seismic	Reinforcing (Seismic Design Category “C”)	X			X		
STEEL CONSTRUCTION:							
Fabricator	Inspection of Fabricators	X	1704.2.5	2			X, 1
Fasteners	Mfr’s Certificate of	X	1704.3	X			3

	Compliance						
Structural Steel	AISC 360	X	1705.2.1 and Table 1705.2.2	2	X		3
Welding	AWS D1.3 AWS D1.4 ACI 318	X	Per Table 1705.2.2	X	X		3
Details	Shop Drawings Review	X	Specs	X	X		
Erection	Installation of High Strength Bolts	X	1704.3.3		X		
Erection	Welding	X	1704.3.1, 1707.2		X		
Erection	Steel Framing & Connections	X	1704.3.2	5	X		
Seismic	Structural Steel	X	1707.2, 1708.4	2, 5	X		
Seismic	Cold-formed Framing – Connections	X	1707.4		X		
Quality assurance	AISC 341		1705.12.2				
ADDITIONAL SEISMIC INSPECTIONS:							
Components	Mechanical & Electrical – Anchorage (SDC =C)	X	1705.11.6		X		
Components	Acoustical Ceilings	X	ASTM E 580	5	X		3
SPRAYED FIRE-RESISTANT MATERIALS							
Spray-on	Manufacturer's data		Specs and 1705.13.1	X			3
Spray-on	Surface conditions		1705.13.2 Mnfgr written instruction			X	
Spray-on	Application		1705.13.2 Mnfgr. Written instruction			X	3
Spray-on	Thickness		1705.13.2 Mnfgr. Written instruction			X	
Spray-on	Density		1705.13.5 Mnfgr. Written instruction			X	
Spray-on	Bond Strength		1705.13.6 Mnfgr. Written instruction			X	3

Special Inspection Notes:

1. Fabricator, supplier, ready-mixed plant and all other similar plants shall provide certificates, prior to fabrication and submitted with shop drawings, from an approved independent inspection, testing or other quality assurance agency attesting that the plant meets at least one of the following criteria:

a. The plant is a certified production plant meeting the quality assurance standards of a recognized national standards organization.
b. The plant maintains an agreement with an independent inspection or quality assurance agency to conduct periodic in-plant quality assurance inspections. The frequency of these inspections shall not be less than one every six months.
c. The plant has an in-shop quality assurance inspection program by an independent testing or quality assurance agency for the work/product to be provided on this project.

2. The Architect and Engineer shall review fabricator/supplier/producer certificates of conformance with appropriate standards of practice and quality assurance.
3. Contractor/supplier shall submit manufacturer's certificate of compliance for the materials/products.
4. Reviews records and test results for conformance for the materials/products.
5. Observes placement and erection of materials during jobsite visits.
6. Unless otherwise noted, the reference numbers listed refer to the 2021 International Building Code (2021 IBC)
7. Special inspection firm shall have expertise in fire protection engineering, mechanical engineering, and certification as an air balancer.

3.3 INSPECTIONS REQUIRED CHAPTER 1:

A. IBC Chapter 1 Inspections

1. Chapter 1 Inspections for this project shall be provided by individuals approved by Office of School Facilities. The required Inspections for this project include but are not limited to:

109.3.2 Concrete slab or under floor inspection
109.3.3. Lowest floor elevation.
109.3.4 Frame inspection.
1093.5 Lath or gypsum board inspection.
109.3.6 Fire-resistant penetrations.
109.3.7 Energy efficiency inspections.
909.3 Special inspection and test requirements (smoke control system)
S406.6 Inspection of fill. Placement of the fill material shall be inspected by the code official.

RR109.1.1. Foundation inspection: Inspection of the foundation shall be made after poles or piers or trenches or basement areas are excavated and any required forms erected and any required reinforcing steel is in place prior to the placing of concrete. The foundation inspection shall include excavations for thickened slabs intended for the support of bearing walls, partitions, structural supports, or equipment.

RR109.1.2 Plumbing, mechanical, gas and electrical systems inspection: Rough inspection of plumbing, appliances are set or installed, and prior to farming inspection.

Mechanical Code: M107.1 Required Inspections

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fireblocking, and bracing are in place and all ducting and other components to be concealed are completed, and prior to the installation of wall or ceiling membranes.

Plumbing Code: P107.1 Required Inspection and testing.

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fireblocking, and bracing are in place and all ducting and other components to be concealed are completed, and prior to the installation of wall or ceiling membranes.

Electrical Code:

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fire-blocking, and bracing are in place and all ducting and other components to be concealed are completed and prior to the installation of concealing construction.

3.4 TEST AND INSPECTION LOG AND FORMS

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours

C. Maintain all logs, inspection reports and related summary sheets as required by Office of School Facilities (OSF). Samples of the required inspection documentation forms from the OSF Inspection Program Manual. The contractor, testing agency and inspectors are required to be familiar with the required forms as well as the current **"INSPECTION PROGRAM MANUAL".** This manual along with the current OSF required inspection forms are available on line at the South Carolina Department of Education web site under Office of School Facilities.

3.5 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

3.6 TESTING AND INSPECTON

A. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings and to satisfy IBC requirements for Chapter1 Inspections and Chapter 17 Special Inspections.

END OF SECTION

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

Seismic Quality Assurance Plan

To be completed by the General Contractor and every Subcontractor responsible for the construction of a designated systems and components listed in the Seismic Quality Assurance Plan. Form is to be submitted to Architect prior to the installation of seismic systems and a copy be available at the final inspection for review of the Authority having Jurisdiction.

Project: SPRINGFIELD MIDDLE SCHOOL – COOLER/FREEZER ENCLOSURE

Architect's Commission Number: 22004

Owner: Fort Mill School District
2233 Deerfield Drive
Fort Mill, SC 29715
Phone: (803) 548-2527

Contact Person: Dr. Charles T. Epps, Superintendent

A Seismic Quality Assurance Plan as required by Section 1704 of the 2021 International Building Code has been defined for this project. The requirement for the Contractor's Statement of Responsibility is required in Section 1704.4 of the IBC.

As a Contractor responsible for the construction of designated seismic force resisting systems and components listed in the quality assurance plan, I acknowledge the following:

1. We acknowledge awareness of the special requirements contained in the quality assurance plan.
2. We acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.
3. We acknowledge that procedures will be maintained for exercising control within our organization to ensure compliance with the seismic design shop drawings and submittals submitted by our company and reviewed and noted by the Architect/Engineer of Record.
4. Person(s) in our organization exercising control of the quality assurance plan requirements and their qualifications are identified below. (if needed attach additional list of personnel with qualifications.)

Submitted by:

_____ _____
(Type or Print Firm name) (Type or Print Name of Firm Owner, Partner or Corporate Secretary)

_____ _____
Signature Date (Corporate Seal)

Owner's Authorization:

_____ _____
Signature Date

Building Official's Acceptance:

_____ _____
Signature Date

PART 1 - GENERAL

1.1 DESCRIPTION

A. Throughout the Project Documents, reference is made to specifications and standards issued by nationally recognized professional and/or trade organizations.

1. Unless otherwise specifically stated, all manufacturer's catalogs, specifications, instructions or other information or literature that are referred to in the specifications shall be considered as the latest edition and/or revision of such publication that is in effect on the date of the Invitation or Advertisement for Bids.

2. When standard specifications such as the American Society for Testing and Materials, Federal specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well-known public or trade associations, are cited as a standard to govern materials and/or workmanship, such specifications or portions thereof as referred to shall be equally as binding and have the full force and effect as though it were copied into these specifications. Such standards as are mentioned are generally recognized by and available to the trades concerned. The Program Manager will, however, upon request of a bidder or Contractor, furnish for inspection a copy of any standard specifications mentioned or direct the bidder or Contractor to an easily available copy. Unless otherwise specifically stated, the standard specifications referred to shall be considered as the latest edition and/or revision of such specifications that is in effect on the date of the Advertisement for Bids. In case of any conflicts between standard specifications and the written portion of the Specifications, the specifications as actually written herein will govern.

3. The referenced standards are generally identified by abbreviating the name of the organization following with the specification/standard number.

4. Unless specifically indicated otherwise, all references to standards refer to the latest edition available at the time of bidding.

1.2 ABBREVIATIONS

A. Wherever the following abbreviations are used in these Project Documents, they are to be construed the same as the respective expressions represented:

AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AGA	American Gas Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALS	American Lumber Standards
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers

ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
AWI	Architectural Woodwork Institute
AWWA	American Water Works Association
AWPA	American Wood Preservers Association
AWS	American Welding Society
BIA	Brick Institute of America
CE	Corps of Engineers
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
CTI	Ceramic Tile Institute of America
DOT	Department of Transportation
EPA	Environmental Protection Agency
FSS	Federal Specifications and Standards, General Services Administration
GA	Gypsum Association
IEEE	Institute of Electrical and Electronics Engineers
MBMA	Metal Building Manufacturer's Association
MCAA	Mechanical Contractors Association of America
MFMA	Marble Flooring Manufacturers Association
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NAPA	National Asphalt Pavement Association
NBHA	National Builders Hardware Association
NCMA	National Concrete Masonry Association
NEC	National Electric Code (Now NFPA)
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPCA	National Paint and Coating Association
NRCA	National Roofing Contractors Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Pre-stressed Concrete Institute
SDI	Steel Deck Institute
S.D.I.	Steel Door Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council
TCA	Tile Council of America, Inc.
UL	Underwriters Laboratories, Inc.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from that required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
   a. Specification Section number and title.
   b. Generic name used in the Contract Documents.
   c. Proprietary name, model number, and similar designations.
   d. Manufacturer's name and address.
   e. Projected delivery date or time span of delivery period.
   f. Identification of items that require early submittal approval for scheduled delivery date.
3. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of

response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided by the Construction Manager / Architect.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction, where available for type of material proposed.
      i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
      j. Cost information, including a proposal of change, if any, in the Contract Sum.
      k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
      l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
   3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
      a. Form of Acceptance: Change Order.
      b. Use product specified if Architect cannot decide on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 1 Section "Submittal Procedure."
b. Use product specified if Architect cannot decide on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedure." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Store cementitious products and materials on elevated platforms.
   5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   7. Protect stored products from damage and liquids from freezing.

D. Material Moisture and Mold Control: Comply with recommendations contained in Associated General Contractors (AGC) document "Managing the Risk of Mold in the Construction of Buildings." Prepare and submit plan for protecting materials from water damage, including the following:
   1. Indicate delivery, checking and storage operations affected by water damage control efforts.
   2. Indicate procedures for protecting porous materials from water damage, and how damaged materials will be handled.
   3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet work has dried sufficiently to permit installation of related finish materials.

4. Describe protocol for dealing with large and unexpected water intrusion into completed portions of building. Indicate procedures for investigation of cause and effects, and methods for dealing with both.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Close-out Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
   6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
   7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
   3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product match.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Requests for substitution following award of contract must comply with requirements of this article and are restricted to those necessitated by the following circumstances:
    1. Specified product is no longer available for purchase.
    2. Specified product is not available within schedule requirements of project.
    3. Specified product is not compatible with other product approved for project.
    4. Specified warranty is not available.

B. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

C. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied and so certified by Contractor. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Requested substitution does not require extensive revisions to the Contract Documents.

2. Requested substitution is consistent with the Contract Documents and will produce indicated results.
3. Substitution request is fully documented and properly submitted.
4. Requested substitution will not adversely affect Contractor's Construction Schedule.
5. Requested substitution has received necessary approvals of authorities having jurisdiction.
6. Requested substitution is compatible with other portions of the Work.
7. Requested substitution has been coordinated with other portions of the Work.
8. Requested substitution provides specified warranty.
9. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 Description

A. Work included: This Section establishes general requirements pertaining to cutting (including excavating), fitting and patching of the work required to:

1. Make the several parts fit properly;

2. Uncover work to provide for installing, inspection, both, of ill-timed work;

3. Remove and replace work not conforming to requirements of the Contract Documents; and

4. Remove and replace defective work.

B. Related Work:

1. Documents affecting work of this section include, but are not necessarily limited to, the contract documents, addenda and General and Supplementary Conditions.

2. In addition to other requirements specified, upon the Construction Managers and/or Architect's request to uncover work to provide for inspection by the Construction Manager and/or Architect of covered work, and remove samples of installed materials for testing.

3. Do not cut or alter work performed under separate contracts without the Construction Manager's and Architect's written permission.

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.

1.3 SUBMITTALS

A. Request for Construction Manager's and/or Architect's consent:

1. Prior to cutting which effects structural safety, submit written request to the Construction Manager and/or Architect for permission to proceed with cutting.

2. Should conditions of the Work, or schedule indicate a required change of materials or methods for cutting and patching, so notify the Construction Manager and/or Architect and secure his written permission and the required Change Order prior to proceeding.

B. Notices to the Construction Manager and/or Architect:

1. Prior to cutting and patching performed pursuant to the Construction Manager's and/or Architect's instructions, submit cost estimate to the Construction Manager and Architect. Secure the Construction Manager's and the Architect's approval of cost estimates and type of reimbursement before proceeding with cutting and patching.

2. Submit written notice to the Construction Manager and/or Architect designating the time the Work will be uncovered, to provide for the Construction Manager's and/or Architect's observation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For replacement of items removed, use materials complying with pertinent Sections of these Specifications.

2.2 PAYMENT FOR COSTS

A. The Owner will reimburse the Contractor for cutting and patching performed pursuant to the written Change Order, after claim for such reimbursement is submitted by the Contractor and approved by the Construction Manager and Architect. Perform other cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching and backfilling.

2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Construction Manager and/or Architect and secure needed directions.

2. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION PRIOR TO CUTTING

A. Provide required protection including, but not necessarily limited to, shoring, bracing and support to maintain structural integrity of the Work.

B. Provide required fire protection including, but not necessarily limited to, fire blankets, fire extinguishing equipment, prior to consent from Construction Manager.

3.3 PERFORMANCE

A. Perform required excavating and backfilling as required under pertinent other Sections of these Specifications.

1. Perform cutting and demolition by methods which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.

2. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

3. All penetrations made by the Contractor through walls, ceilings, and/or floors shall be sealed by the Contractor to meet the requirements of all building codes, fire codes, applicable to this project.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this section.

1.1.2 Related work:

A. Documents affecting work of this section include, but are not necessarily limited to, the contract documents, addenda and General and Supplementary Conditions.

B. In addition to standards described in this section, comply with requirements for cleaning as described in pertinent other sections of these Specifications.

1.2 QUALITY ASSURANCE

1.2.1 Conduct daily inspection and more often if necessary, to verify that requirements for cleanliness are being met.

1.2.2 In addition to the standards described in this section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

2.1.1 Provide required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

2.2.1 Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

3.1.1 General

A. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage and providing required protection of materials.

B. Do not allow accumulation of scrap, debris, waste material and other items not required for construction of this work.

C. At least twice each month and more often if necessary, completely remove all scrap, debris and waste material from the job site. Provide adequate storage for all items waiting removal from the job site, observing requirements for fire protection and protection of the ecology.

3.1.2 Site

A. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove such items to the place designated for their storage.

B. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph 3.1.1.A above.

C. Maintain the site in a neat and orderly condition at all times.

3.2 FINAL CLEANING

3.2.1 "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

3.2.2 Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in paragraph 3.1 above.

3.2.3 Schedule final cleaning as approved by the Construction Manager / Architect to enable the Owner to accept a completely clean work.

END OF SECTION

1.0 GENERAL

1.1 Deficiency Lists

A. During the construction of the work, the Construction Manager and/or Architect/Engineer shall inspect the work for conformance to the Contract Documents.

B. Should an inspection reveal work that is not in conformance with the Contract Documents, and if the nature of the non-conformance warrants, at the sole discretion of the Construction Manager and/or Architect/Engineer, a written list of deficiencies will be issued.

C. The "deficiency list" as hereinafter called, shall stipulate the item or items of work that are in non-conformance and shall specify a reasonable time for the deficient work to be brought into conformance with the Contract Documents.

D. Upon receipt of the deficiency list the Contractor shall by any and all means at his disposal, endeavor to correct the work within the time stipulated. The Contractor shall notify the Construction Manager in writing when the work has been corrected and request an inspection.

E. If the inspection reveals the deficiency has been corrected, then the deficiency list shall be rescinded.

F. During the period that the deficiency list is in effect, the Construction Manager may, at his option, not authorize the payment of progress billings until the deficiency list is rescinded or, in the opinion of the Construction Manager, the Contractor is making a good faith effort to correct the deficiency.

1.2 Punch Lists/Final Inspection

A. When the Contractor determines that his work or portions of his work are sufficiently near completion to warrant a preliminary inspection, **he shall request in writing to the Construction Manager a preliminary inspection.**

B. At a mutually agreed upon time, the Construction Manager, Architect/Engineer and Contractor shall conduct a preliminary inspection of the work for completeness, conformance to the Contract Documents and compliance with applicable codes. Any items noted as incomplete shall be listed on a preliminary punch list, a copy of which shall be forwarded to the Contractor for completion and correction. If it is determined by the Architect and Construction Manager that the work is not complete or sufficiently near completion, then the Contractor shall prepare his own preliminary punch list, forward copies to the Construction Manager for review, and repeat Part A above.

C. The Construction Manager shall establish a reasonable time period for the completion or correction of all items on the preliminary inspection punch list. All items on the preliminary punch list shall be completed **prior to inspection by State Agencies or Authorities Having Jurisdiction (AHJ).**

D. Any incomplete or non-compliance items found during the State Agency or AHJ inspection shall be completed by the Contractor within seven (7) days of the inspection or earlier if required by the Construction Manager.

E. Upon completion of the State Agency or AHJ inspection list, and if the completeness of the work allows, the Architect/Engineer shall issue a Certificate of Substantial Completion. Should the amount of incomplete work be such that a Certificate of Substantial Completion cannot be issued, the Contractor shall complete all remaining work and request in writing to the Construction Manager a subsequent inspection for Substantial Completion.

F. Once a Certificate of Substantial Completion has been issued, a final inspection shall be held with the Owner, Architect/Engineer, Construction Manager and Contractor. Any items noted during the final inspection will be documented in a final inspection punch list and forwarded to the Contractor for completion. All final inspection punch list items shall be completed with fourteen (14) days of receipt of the final inspection punch list. Once all final punch list items are complete, the Architect/Engineer shall establish the date of final completion.

1.3 Project Close-Out

A. Final Close-Out and Payment

1. The Contractor may make Application for Final Payment after the Certificate of Substantial Completion has been issued. The following items must be submitted to the Construction Manager prior to processing of the Final Application for Payment:

a. Affidavit of Payment of Debts and Claims, (AIA-G706);
b. Consent of Surety, (AIA-G707);
c. Release of Liens, (AIA-G706A) from: Contractors, Sub-Contractors, and Material Suppliers;
d. Letter on company letterhead stating all temporary facilities, services, debris and surplus materials have been removed;
e. Final "Project Record Documents" as specified in Section 01 78 39, Project Record Documents;
f. Operations & Maintenance Manuals as specified in Section 01 78 39, Project Record Documents;
g. Final topographical survey as required by 01 73 00;
h. Guarantees, Warranties, and Bonds as specified in Section 01 78 39, Project Record Documents;
i. Spare parts and replacement items as required by the Specifications;
j. Letter on company letterhead stating no asbestos containing material has been installed in the project;
k. Executed Certificate of Substantial Completion;
l. Demonstration, testing and training of equipment is completed;
m. Completed final inspection punch list signed by the Contractor verifying that each item is complete.

2. **No final payment application will be processed for payment until final inspection and final acceptance.**

3. Close-out time encompasses a large amount of work during a short period of time. Therefore, the Contractor is encouraged to begin to submit close-out items as soon as possible so that the Contract may be completed, thus

allowing the Architect/Engineer to recommend approval of the final payment to the Owner.

4. The Construction Manager may continue to withhold no less than 5% retainage from the Contractor until all outstanding close-out materials are submitted to the Construction Manager. It shall be at the discretion of the Construction Manager, upon consultation with the Architect, to reduce the amount of retainage on a project by project basis, upon a favorable review of the status of completion of the final punch list, the status of close-out submittals, and above all, the total amount listed on the Release of Liens submitted by the Contractor for all Sub-Contractors and Material Suppliers contracted with by the General Contractor. At no time shall the retainage be reduced to an amount less than the total of the Release of Liens submitted by the Contractor. Final payment may then be made once all remaining outstanding close-out requirements are met.

1.4 Responsibility

A. It shall be the Contractor's responsibility to see that all requirements of this Section of the Specifications are executed and complete in a timely manner.

B. No provisions of this section of the Specifications shall in any way relieve the Contractor of completing his work on time and in accordance with the Project Schedule.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:

1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Paragraph 2.1 below. Upon completion of the Work, deliver the recorded changes to the Construction Manager.

2. Final record survey, performed by a Professional Land Surveyor, of installed underground materials and final grades.

3. To aid in the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the operation and maintenance manuals and data as described in this Section and in other pertinent sections of these Specifications.

4. Compile specified guarantees, warranties and bonds, as well as specified service and maintenance contracts. Co-execute submittals when so specified and review submittals to verify compliance with Contract Documents. Submit to Construction Manager for review and transmittal to Owner.

B. Related work:

1. Documents affecting work of this section include, but are not necessarily limited to, the contract documents, addenda and General and Supplementary Conditions.

2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these specifications.

3. Documents affecting the various warranties required:

a. General Warranty of Construction: General Conditions of the Contract.

b. Warranties, Guarantees, & Bonds Required for Specific Products: Each respective section of Specifications as listed in the Project Manual.

c. Provision for Duration of Warranties Guarantees, & Bonds: The respective section of specifications which specifies the product.

1.2 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Drawings to one person on the Contractor's staff as approved by the Architect/Engineer.

B. In preparing operation and maintenance manuals and data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

C. In preparing warranties, guarantees, and bonds, utilize personnel familiar with the requirements of the specifications regarding each. A detailed analysis of each specification is to be performed to assure all specified warranties, guarantees, and bonds are accounted for and submitted.

D. Accuracy of records:

1. Accuracy of records shall be such that a future search for items shown on the Project Record Drawings may rely reasonably on the information provided under this Section of the Work.

1.3 SUBMITTALS

A. Project Record Drawings

1. The Architect/Engineer's approval of the current status of Project Record Drawings may be a prerequisite to the Architect/Engineer's approval of requests for progress payment and request for final payment under the Contract.

2. Prior to submitting each request for progress payment, secure the Architect/Engineer's approval of the current status of the Project Record Drawings.

3. Prior to submitting request for final payment, submit the final Project Record Drawings to the Architect/Engineer and secure his approval.

B. Operation and Maintenance Manuals

1. Comply with pertinent provisions of Section 01 33 00 Submittal Procedure.

2. Unless otherwise directed in other Sections, or in writing by the Construction Manager, submit **THREE** copies of the final Manual to the Construction Manager prior to indoctrination of operation and maintenance personnel.

3. Submittals of approved copies of operation and maintenance data will be a prerequisite for approval of final payment applications.

C.Warranties, Guarantees and Bonds

1. Provide warranties, guarantees, and bonds as specified in Divisions 01-33.

2. Unless otherwise directed in other Sections, or in writing by the Construction Manager, submit two copies of each specified warranty, guarantee, and bond to the Construction Manager.

3. Submittals of approved copies of warranties, guarantees, and bonds will be a prerequisite for approval of final payment applications

PART 2 - PRODUCTS

2.1 JOB SET RECORD DOCUMENTS

A. Promptly following receipt of the Owner's Notice to Proceed, obtain and provide, at no charge to the Owner:

1. One complete set of all Documents comprising the Contract, including Plans, Specification Manuals, and Shop Drawings.

2. Field survey books for use in staking sewer work.

B. Immediately upon receipt of the job set described in subparagraph 2.1.A.1 above, identify each of the Documents with the title, "RECORD DRAWINGS - JOB SET", and “RECORD SPECIFICATIONS - JOB SET”.

C. Preservation:

1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect. Maintain the job set of Record Drawings completely protected from deterioration and from loss and damage until completion of the Work and transfer to the Construction Manager.

2. In the event of loss of recorded data, use means necessary to again secure the data to the Architect/Engineer's approval.

a. Such means shall include, if necessary, in the opinion of the Architect/Engineer, removal and replacement of concealing materials.

b. In such case, provide replacements to the standards originally required by the Contract Documents.

3. Do not use the job set for any purpose except entry of new data and for review by the Architect.

4. Maintain the job set at the site of Work that is designated by the Architect.

D. Making entries on Job Set Drawings:

1. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.

2. Show by station number location of all fittings, manholes, valves, wye locations, etc.

3. Reference all valves to above ground items deemed to be reasonably safe from being relocated and indicate such references on the drawings.

4. Show location of electrical conduit, pull boxes, etc.

5. Show all finish grades.

6. Note related Change Orders, Supplemental Instructions, Requests for Information on plan sheets where applicable.

7. Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications.

8. Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations.

E. Submittal:

1. Submit "marked-up" set of drawings to the Construction Manager.

2. Make any necessary additions as required by the Architect.

3. Submit field survey books to the Construction Manager.

4. Submit one complete set of Product Data (Shop Drawing) submittals. All submittals are to include approval stamp of Architect/Engineer.

2.2 OPERATION AND MAINTENANCE MANUALS

A. INSTRUCTION MANUALS: Where Instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provision of this Section.

1. Format:

a. Size: 8-1/2" x 11"

b. Paper: White bond, at least 20 lb. weight

c. Text: Neatly written or printed

d. Drawings: 11" in height, preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.

e. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.

f. Binding: Use heavy-duty plastic or fiber

g. Measurements: Provide all measurements in U.S. standard units

such as feet-and-inches, lbs, and cfm; where items may be expected to be measured within ten years in accordance with metric formula, provide additional measurements in the "International System of Units" (SI).

2. Provide front and back covers for each Manual, using durable material approved by the Architect, and clearly identified on or through the cover with at least the following information:

   OPERATING AND MAINTENANCE INSTRUCTIONS

   (name and address of work)
   (name of Contractor)
   (general subject of this manual)
   (approval signature of Construction Manager)
   (approval date)

3. Contents: Include at least the following:

   a. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.

   b. Complete instructions regarding the installation and maintenance of all equipment involved including lubrication, disassembly, and reassembly.

   c. Complete nomenclature of all parts of all equipment.

   d. Complete nomenclature and part number of all other data pertinent to procurement procedures.

   e. Copy of all guarantees and warranties issued.

   f. Manufacturer's bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturer's data.

   g. Such other data as required in pertinent Sections of these Specifications.

4. Complete the Manuals in strict accordance with the approved preliminary drafts and the Construction Manager's and Architect's review comments.

5. Any and all other items required by the specific specifications relating to the maintenance and operations of the various components of the work or any and all certificates and testing reports required by the specific specifications shall be incorporated into the maintenance manuals. Items of this nature shall include but are not limited to:

   a. Test and balance reports of HVAC systems.

   b. Test and certification reports of electrical systems such as fire alarm and life safety systems, communications systems, clock

systems, etc.

c. Valve tag lists

d. Certification of sterilization of potable water systems.

B. MAINTENANCE TRAINING: Each Subcontractor shall instruct the Owner in the proper care, maintenance and operation of all systems installed under his Contract. Provide a written letter stating that the Owner has been instructed and list the following:

1. Date, time and place of instruction

2. Parties present

3. Systems and items instructions were given on

2.3 WARRANTIES, GUARANTEES, AND BONDS

A. All work under this Contract shall be guaranteed by the Contractor against defects in material or workmanship for a period of one year from the Date of Substantial Completion, as established in writing by the Architect/Engineer, unless a longer period is specified for a particular item of work in the specifications. In which case, the longer period shall be the Guarantee Period.

B. Prior to the end of the Guarantee Period, the Owner may have the Architect/Engineer inspect the Work, and shall advise the Architect/Engineer of any known defects. The Architect/Engineer or the Owner shall notify the Contractor, in writing, of any defects found.

C. The Contractor agrees to repair or replace all defects in material or workmanship within sixty (60) days of the date of the written notice from the Architect/Engineer or the Owner.

D. The Contractor shall furnish the Owner with three (3) copies of a written one-year guarantee delivered with the close-out documents, on the Contractor's stationery with original signatures on each copy, signed and sealed the same as the Bid Form, stating:

"The undersigned guarantees all work furnished by (Company Name) , for a period of one (1) year from the date of Substantial Completion, and agrees to repair or replace defects within sixty (60) days upon notice of defects by the Owner."

E. Submit warranties, bonds, service and maintenance contracts as specified in respective sections of Specifications.

1. Assemble warranties, bond and service and maintenance contracts, executed by each of respective manufacturers, suppliers, and subcontractors.

2. Number of original signed copies required: Two each.

a. Format:

1). Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder.

2). Fold larger sheets to fit into binders.

3). Cover: Identify each packet with typed or printed title "GUARANTEES, WARRANTIES AND BONDS". List:

a). Title of Project

b). Name of Contractor

3. Binders: Commercial quality three-ring, with durable and cleanable plastic covers.

4. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

a. Product or work item.

b. Firm, with name of principal, address and telephone number.

c. Scope.

d. Date of beginning of warranty, bond or service and maintenance contract.

e. Duration of warranty, bond or service and maintenance contract.

f. Provide information for Owner's personnel:

1). Proper procedure in case of failure.

2). Instances which might affect validity of warranty or bond.

g. Contractor, name or responsible principal, address and telephone number.

F. For equipment or component parts of equipment put into service during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

2. Note: Warranty periods for equipment started during construction will not start until substantial completion for the project, including all HVAC equipment such as split system heat pumps, dehumidification equipment, exhaust fans, air handlers, etc.

G. Otherwise make submittals within ten days after Date of Substantial Completion, prior to final request for payment.

H. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

END OF SECTION

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of manufactured material and product, including forming and reinforcement accessories, admixtures, waterstops, joint systems, joint fillers, curing compounds, and others if requested.

C. Design Mixes: For each concrete mix.

1. Provide laboratory tests of materials and mix design tests.
2. Indicate amounts of mix water, if any, to be withheld for later addition at Project site.
3. Specify the location of the batch plant where the concrete will be mixed and the approximate distance from the job site.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, spacings, bent bar diagrams, arrangement, and supports of concrete reinforcement.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete work similar to that indicated for this Project with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to the Architect, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each type of admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 318, "Building Code Requirements for Structural Concrete."
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material.

B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

a. High-density overlay, Class 1, or better.
b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, unless otherwise indicated.

D. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no metal closer than 1 inch to the plane of the exposed concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric 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. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2. Precast concrete supports or concrete bricks may be used only for concrete members cast on earth. Reinforcement shall be wire-tied to these type supports periodically to prevent it from becoming dislodged during concrete placement.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 36. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Cement shall contain no more than 0.60% total alkalis.

B. Fly Ash: ASTM C 618, Class C or F.

C. Normal Weight Aggregate: ASTM C 33.

D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. Retarding Admixture: ASTM C 494, Type B.

E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

F. High-Range Water-Reducing Admixture: ASTM C 494, Type F.

G. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

H. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.6 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.7 CURING MATERIALS

A. Contractor shall verify that curing and sealing materials applied to floor slabs are compatible with all floor stains, coatings, tile, and other finish materials.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry. (Burleen non-staining mats).

D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Acceptable products include, but are not limited to:

1. 1100-CLEAR, W.R. Meadows, Inc.
2. W.B. Resin Cure, Conspec Marketing & Manufacturing Co., Inc.
3. KUREX DR VOX, Euclid Chemical.
4. CURE & SEAL WB, SpecChem.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 RELATED MATERIALS

A. Expansion and Isolation Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Thickness 1/2 inch unless otherwise indicated. Acceptable products include, but are not limited to:

1. Fibre Expansion Joint, W.R. Meadows, Inc.

B. Vapor Barrier: See Division 7 specifications.

C. Slab Granular Base Course: Clean crushed stone, crushed gravel, or manufactured or natural sand. Material shall be compactable. Rough or sharp materials which may puncture the vapor barrier shall not be used.

D. Dovetail Anchor Slots: Hot-dipped galvanized sheet steel, not less than 0.0336 inch thick with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

E. Latex Bonding Agent: ASTM C 1059, Type I or II, non-redispersible, acrylic emulsion or styrene butadiene.

F. 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 suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

G. Epoxy Anchoring Adhesive: ASTM C 881, two-component epoxy resin, supplied in manufacturer's standard side-by-side cartridge and dispensed through a mixing nozzle supplied by the manufacturer, of class and grade to suit requirements.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.10 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal weight structural concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

D. Maximum Slump:

1. Concrete containing high-range water-reducing admixture or plasticizing admixture: 8 inches, after admixture is added to concrete with verified slump of 2 to 4 inches.
2. Other concrete: 4 inches, plus or minus one inch.

E. 28-Day Compressive Strength: As indicated. Water-cementitious materials ratio shall not exceed 0.50 for slabs-on-grade and elevated slabs.

F. Air Content: In exterior concrete which is exposed to weather, add air-entraining admixture to result in concrete at point of placement having an air content of 5.5 percent within a tolerance of plus or minus 1.5 percent. Footings and other subterranean concrete do not require air-entrainment.

G. Do not air entrain concrete in trowel-finished interior floors and suspended slabs except where air entrainment is required to achieve specified unit weights for lightweight concrete, or where a certain entrained air content is specified by the applicable UL fire-rated assembly. Do not allow entrapped air content in non-air-entrained concrete to exceed 3 percent.

H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

I. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

B. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, fabricate reinforcing so that lap splices in alternate bars are staggered.

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 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. Job site mixing is not permitted.

C. Fiber Reinforcement: In concrete where fiber reinforcement is indicated, uniformly disperse synthetic fibers in concrete mixture.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class D, 1 inch for rough-formed finished surfaces which will be permanently concealed from view.

D. Construct forms tight enough to prevent loss or leakage of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1 vertical to 1.5 horizontal.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, water, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

B. Conduits, Pipes, and Sleeves: Conduits are not permitted in elevated slabs or slabs on grade. Conduits, pipes and sleeves shall be permitted to be embedded in other concrete elements only with approval of the Structural Engineer. Embedded items must meet the following requirements:

1. Conduits, pipes and sleeves shall be made only of materials not harmful to concrete. Aluminum is not permitted.
2. Diameter of items shall not be larger than 1/3 the thickness of the wall, footing, or beam in which they are embedded.
3. Items shall not be spaced closer than 3 diameters on center.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. Retaining walls and basement walls may not be backfilled until after 7 days minimum and after the concrete has achieved 100 percent of 28-day design compressive strength as verified by compression test results.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301, and recommendations in ACI 347 for design, installation, and removal of shoring and reshoring. Structural concrete is not designed for heavy construction loads. Shore and support structural elements at lower levels as required to ensure building safety and to prevent damage. Design forms and their supports to safely support concrete, workers, and equipment without appreciable deflection. Contractor is solely responsible for the design, construction, and safety of forms and supports, to provide forms

which will result in concrete of proper size and shape in addition to safely supporting the structure and loads imposed.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, install reinforcing so that lap splices in alternate bars are staggered.

D. Before concrete is placed, accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. “Wet-sticking” of dowels, anchor bolts and reinforcing is not permitted. **Do not weld or tack weld reinforcing bars** unless indicated on the drawings or authorized by the Structural Engineer.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets so that length of overlap measured between outermost cross wires of each fabric sheet is not less than one spacing of cross wires plus 2 inches. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

G. Where blockouts are formed in slabs, unless otherwise indicated provide two #4 diagonal bars, 4’-0” long, at each corner of the blockout in the middle of the depth of the slab.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Provide construction joints at all locations where concrete placement is terminated resulting in concrete elements not being completed in a single monolithic placement. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Provide keys at construction joints using preformed galvanized steel or wood bulkhead forms, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Locate joints in continuous wall footings as required to facilitate construction.
6. In areas with terrazzo or hard tile, coordinate joint locations to match joints in terrazzo or tile.

C. Contraction (Control) Joints in Slabs on Grade: Construct contraction joints in slabs on grade to form patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab thickness unless otherwise indicated.

1. Contraction joints shall be cut as soon as possible after slab finishing as may safely be done without dislodging aggregate or raveling joint edges. Joints shall be cut within 12 hours after concrete is placed.
2. If joint pattern is not shown, provide contraction joints at a maximum spacing of 15 feet in each direction. Locate to conform to bay spacing where possible (at column centerlines, half bays, third bays.)
3. In areas with terrazzo or hard tile, coordinate joint locations to match joints shown in terrazzo or tile.

D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless water has been withheld from the mix for this purpose.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. 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 the average daily outdoor temperature is expected to fall below 40 deg F for three successive days, or when freezing temperatures may occur during the first 24 hours after concrete placement, deliver and maintain concrete temperature within the temperature range required by ACI 306.1. The average daily outdoor temperature is the average of the highest and lowest temperature during the period from midnight to midnight.
2. Uniformly heat water and/or aggregates before mixing to obtain a concrete mixture temperature at point of placement within the temperature range required by ACI 306.1.
3. Temperatures specified to be maintained shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air.
4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
5. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
6. **Do not use calcium chloride.**

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is included in calculation of 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.

H. Blockouts in concrete walls to allow for erection of steel columns and beams shall be filled with concrete after the steel is erected and plumbed.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view, to receive a rubbed finish, or to be covered with a coating material applied directly to the concrete. This is the concrete surface imparted by selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes

and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Rubbed Finish: Apply a grout-cleaned rubbed finish as follows to smooth-formed finished concrete where indicated. Rubbed finish shall be done when the air temperature is at least 40 deg F and rising. All finishing on an area shall be completed the same day it is started.

1. Surfaces to be grout cleaned shall be steel brushed to remove laitance and scale and to reveal partly obscured air bubble holes. Uneven form joints shall be ground smooth.
2. Combine one part portland cement to one and one-half parts fine sand by volume, with sufficient water to produce a grout having the consistency of thick paint. Blend standard and white portland cement in amounts determined by trial patches so that final color of dry grout will produce the color desired by the architect.
3. Thoroughly dampen concrete surfaces and cover with an application of grout.
4. Immediately after application of the grout, the surface shall be scoured with a cork float or other suitable material. This floating shall completely fill all holes and other irregularities in the surface.
5. When the grout is of such plasticity that it will not be pulled from the holes, remove excess grout by scraping and rubbing with a clean float of sponge rubber or burlap.
6. When the grout is thoroughly dry, the surface shall be vigorously rubbed with dry burlap to completely remove any dried grout. No visible film of dry grout shall remain.
7. Obtain approval of a sample area from Architect before proceeding with Work.
8. Final product shall be uniform in color and texture.
9. Keep surfaces damp for at least 36 hours after rubbing.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: All slabs shall first receive a float finish. Machine floating shall not be used until the concrete surface will support a finisher on foot without more than a 1/4 inch indentation.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, wood flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, stain, or another thin film-finish coating system.

2. Slabs on grade which are scheduled to receive polished concrete shall receive a hard steel trowel finish (3 passes).

3. On lightweight concrete slabs containing entrained air, machine floating shall be started as late as possible and hard and prolonged troweling shall be avoided.

4. Finish surfaces to the following tolerances, according to ASTM E 1155:

a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where terrazzo, ceramic or quarry tile is to be installed by thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes, beam pockets, column pockets, and openings left in concrete structures, unless otherwise indicated, 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 indicated or required to complete Work.

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

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide 3000 psi normal weight concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and trowel-finish concrete surfaces. At stair landings, provide plain-steel welded wire fabric, of the same size used in adjacent floor slabs, located at mid-depth of the concrete fill.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection of concrete.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss exceeding 0.1 pounds per square foot per hour, based on chart in ACI 305R, 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture 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. Cure for not less than seven days. 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 of seven days.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period of seven days.

F. Remove curing and sealing materials from floor slabs, without damaging concrete surfaces, by method recommended by curing and sealing manufacturer after the curing period in areas where floor stains, coatings, tile, and other floor finish materials are to be applied if recommended by the floor finish manufacturer.

G. At polished concrete areas, use one of the moisture curing methods listed above. Do not use curing or sealing compounds.

3.12 POLISHED CONCRETE FLOOR TREATMENTS

A. During grinding operations, apply a liquid crack and gap filler to fill pinholes, small air voids, microcracks and other gaps in the concrete surface. Apply product in accordance with the manufacturer’s recommendations. Acceptable products include, but are not limited to:

1. Consolideck Grind-N-Fill, Prosoco.

B. During grinding operations, apply a liquid hardener and densifier. Apply product in accordance with the manufacturer’s recommendations. Acceptable products include, but are not limited to:

1. H&C Clear Liquid Hardener & Densifier, H&C.

C. After grinding operations are complete apply a protective finish material to provide a gloss finish and improve stain resistance. Apply product in accordance with the manufacturer's recommendations. Acceptable products include, but are not limited to:

1. LSGuard, Prosoco.
2. H&C Lithium Protective Finish, H&C.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 BONDING NEW CONCRETE TO EXISTING CONCRETE

A. At locations where new concrete is placed adjacent to existing concrete, unless indicated otherwise, clean and roughen the face of the existing concrete and provide a bonding agent in accordance with the manufacturer's recommendations.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Concrete which will be exposed to view in the finished structure shall be restored to its original intended appearance or shall be removed and replaced. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension, down to solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at an inconspicuous location to verify mixture and color match

before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness by using a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

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 one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., plus one set for each additional 50 cu. yd. more than the first 25 cu. yd.

    a. When frequency of testing will provide fewer than five compressive-strength tests for a given concrete mix, 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; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 90 deg F and above.
5. Density: ASTM C138/C138M, fresh density of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days two at 28 days, and hold one specimen in reserve for later testing if necessary.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if every average of any three 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, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project name, date of concrete placement and testing, location of concrete batch in Work, mix identification including design compressive strength at 28 days, slump, compressive breaking strength, and type of break for both 7-and 28-day tests. Air content and concrete temperature results shall also be provided when applicable.

E. Special inspector shall monitor the installation of post-installed concrete anchors and reinforcing. Before installation of each type anchor or reinforcing begins, the inspector shall verify that the contractor’s proposed installation procedure conforms with the manufacturer’s printed installation instructions (MPII). The inspector shall monitor the initial installation of each type of anchor or reinforcing to verify conformance with the (MPII) and shall monitor periodically thereafter.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive devices will not be used as sole basis for approval or rejection of concrete.

G. Additional Tests: Special inspector shall make additional tests of concrete at Contractor’s expense when test results indicate that slump, air entrainment, compressive strength, or other requirements have not been met, as directed by Architect. Special inspector may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall fill core-drilled holes with non-shrink grout unless directed otherwise by Architect.

END OF SECTION 033000

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Concrete Brick.

C. Clay Facing Brick.

D. Mortar and Grout.

E. Reinforcement and Anchorage.

F. Lintels.

G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 2300 - Reinforced Unit Masonry: Additional requirements for reinforced load-bearing masonry.

B. Section 05 5000 - Metal Fabrications: Loose steel lintels.

C. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.

D. Section 07 2119 – Closed Cell Foamed-in-Place Insulating System: Weather barrier for masonry surfaces and membrane flashings.

E. Section 07 1900 - Water Repellents: Masonry waterproofing.

F. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.

G. Section 07 9005 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 PRICE AND PAYMENT PROCEDURES (Not applicable to this project)

A. This allowance includes purchase, sales tax and delivery of face brick. Installation is not included in the allowance but is specified in this section and is part of the Contract Sum/Price.

1.04 REFERENCE STANDARDS

A. ACI 216.1/TMS 0216.1 - Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies

B. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2008.

C. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

D. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

E. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2009b.

G. ASTM C 33 - Standard Specification for Concrete Aggregates, 2007.

H. ASTM C 55 - Standard Specification for Concrete Brick; 2009.

I. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2009.

J. ASTM C 90 - Standard Specification for Load bearing Concrete Masonry Units; 2009.

K. ASTM C 91 - Standard Specification for Masonry Cement; 2005.

L. ASTM C 128 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

M. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2010.

N. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2004.

O. ASTM C 150 - Standard Specification for Portland Cement; 2007.

P. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.

Q. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2007a.

R. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2008a.

S. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

T. ASTM C 331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units; 2005.

U. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 2007.

V. ASTM C 476 - Standard Specification for Grout for Masonry; 2009.

W. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2009.

X. ASTM C 1634 - Standard Specification for Concrete Facing Brick; 2009.

Y. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.

Z. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four full-size samples of facing brick and each type of concrete block units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
   1. The producer of the concrete masonry units shall furnish a letter of certification stating that all aggregates used conform to the specifications as noted herein and ASTM standards. Certificate shall indicate the type of aggregates that are used in the mix design.
      a. Certificate shall include ACI 216 fire resistance certification.
      b. Certificate shall include UL fire resistance certification.
      c. Certificate shall include ASTM C90 certification.
      d. Certificate shall certify that lightweight aggregate complies with ASTM C331 with 6% to 10% absorption when tested in accordance with ASTM C128.
      e. Certificate by independent testing facility that the lightweight aggregates are 100% recycled material.
      f. Certificate stating minimum STC rating of each type block and that block meet

specified sound transmission requirements.
g. Test Report showing stain index per ASTM C641 =0.
h. Test Report showing organic impurities per ASTM C40 < 1.
2. Brick test reports shall show:
a. Compressive strength.
b. 24 - hr. cold water absorption.
c. 5 - hr. boil absorption.
d. Saturation coefficient.
e. Initial rate of absorption (suction).
3. Provide certificates for each type of fire rated masonry.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

F. Contractor shall provide the Owner with one cube (1,000 brick) of utility brick for each color used on the project upon project completion. Deliver to storage location as directed by Owner.

1.06 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

B. Fire Rated Assemblies: Conform to applicable code and UL requirements for fire rated masonry construction as noted on drawings.

C. All membrane wall and flashings around building openings are to be installed by an established and qualified waterproofing contractor.

1.07 EXTERIOR WALL ASSEMBLY MOCK-UP (Facing the sun)

A. Construct a masonry wall as a mock-up panel sized 6 feet long by 5 feet high; include mortar and accessories, structural backup, flashings, and each type of unit as directed by Architect, including cast stone masonry units, Aluminum Window System (with glazing and sillpans) and all other components as detailed and specified in the mock-up. Coordinate with all building envelope trades as conditions at ALL adjacent construction are to be included.
1. Mock-up panel shall show the complete and full range of exposed texture and color to be expected in the work and shall indicate materials, bond, joint tooling and workmanship to be expected in the final work.

B. Erect mock up panel in ‘cut away’ stages to allow for proper review.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.
1. Retain panel during construction as standard for judging completed masonry work. Do not alter, move or destroy panel until work is completed and accepted.

1.08 COLOR SELECTION PANELS (Facing the sun)

A. A minimum of (1) 3’ x 4’ panels will be required to be constructed for the purposes of selecting exterior masonry and mortar colors. (Match existing exterior colors)

B. Following color selections by the architect; the exterior wall assembly mock up panel is to be constructed in the selected colors. (Contractor to provide samples matching existing exterior colors)

1.09 DELIVERY, STORAGE, AND HANDLING

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

B. Handle and store masonry units in protective cartons or trays. Do not remove from protective

packaging until ready for installation. Stored units shall remain covered until installed.

C. Units shall be handled to avoid breakage and chipping. Any chips outside of the requirements of specified ASTM standards shall not be placed in the finished wall. Units placed in the wall will be the responsibility of the installer and damaged units shall be replaced as directed by the Architect.

D. Protect reinforcement from elements

1.10 JOB CONDITIONS:

A. Protection of Work:
1. During erection, cover top of wall with strong waterproof membrane at end of each day or shutdown. Cover partially completed walls when work is not in progress. Extend cover minimum of 24 in. (610 mm) down both sides. Hold cover securely in place.
2. Protect door jambs and corners from damage during construction.

B. Load Application:
1. Do not apply uniform floor or roof loading for at least 12 hours after building masonry columns or walls.
2. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.

C. Staining:
1. Prevent grout or mortar from staining the face of masonry to be left exposed or painted. Remove excess grout or mortar immediately that is in contact with face of masonry. Protect all sills, ledges and projections from droppings of mortar.
2. Protect the base of all walls from rain, mud and mortar splashes with straw or sand.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
1. Adams Products Company; www.adamsproducts.com
2. Johnson Concrete Products; www.johnsoncmu.com
3. Southeastern Concrete Products; www.seconcreteproducts.net
4. Substitutions: See Section 01 60 00 Product Requirements.

2.02 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
1. LEED requirements:
a. Regional Materials - Concrete Masonry Units shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
b. Concrete block walls consisting of 8" x 8" x 16" units shall meet STC rating of 45 or more.
c. Recycled Content of Lightweight Aggregate: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 50 percent.
d. Lightweight aggregates shall be certified by an independent testing facility that lightweight aggregates meet all qualifications of 100% recycled material.
2. Size: Standard units shall be modular with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
a. Units shall be sound, free from cracks, chipped edges and other defects and have a uniform fine texture.
b. Units shall be delivered to the project site in an air-dried condition.
3. Aggregates: All units shall be free of organic impurities that will cause rusting, staining or pop outs, and shall contain no combustible matter.

a. Lightweight Aggregate: ASTM C331 and C330; Lightweight aggregate shall be 100% expanded shale Stalite material produced by the rotary kiln process with 6% to 10% absorption when tested in accordance with ASTM C128 and shall be graded to assure constant texture.
b. Normal weight Aggregate: ASTM C33
c. THE USE OF COAL CINDER AGGREGATE/BOTTOM ASH OR SIMILAR WASTE PRODUCTS OR OTHER IMPURITIES WILL NOT BE ALLOWED.

4. All 8-inch deep or larger units shall meet ACI 216 requirements for 2 hour or greater fire resistance.
5. Special Shapes: Provide non-standard blocks configured for square corners, lintels, headers, control joint edges, bond beams, and other detailed conditions.
   a. Provide radius corners.
6. Load-Bearing Units: ASTM C 90, lightweight. (25 lb block minimum with STC rating 45 minimum for 8" and 12" units)
   a. Hollow block.
   b. Exposed faces: Manufacturer's standard color and texture where indicated.
   c. 2 &3-hour fire resistance rating certified by UL.
7. Fire Resistance: Provide units that comply with fire rating indicated as shown. Fire-rated units shall be manufactured to comply with the minimum equivalent thickness required for the fire resistance indicated and the type of aggregate used.
   a. Provide 2 &3-hour fire resistance rating certified by UL.

B. Concrete Brick:
1. For architectural and paver use, ASTM C 1634 (or ASTM C 55-03 Grade N), non-cored (solid), medium weight.
2. For other uses, ASTM C 55, medium weight.
3. Size: As indicated on drawings.

2.03 CLAY BRICK UNITS

A. LEED requirements:
1. Regional Materials: Brick shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project Site.

B. Facing Brick: ASTM C 216, Type FBS, Grade SW.
1. Color and texture:
   a. Brick Color #1 (Field): Utility Brick, 4 x 4 x 12 (Nominal)
   b. Brick Color #2 (Accent): Utility Brick, 4 x 4 x 12 (Nominal)
   c. See Allowances for brick allowance per 1000 brick
2. Nominal size: Utility - 3-5/8" high x 11-5/8" wide x 3-1/2" deep;
   Closure brick – 3-5/8” high x 7-5/8” wide x 3-1/2” deep
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
4. Compressive strength: 8,000 psi, measured in accordance with ASTM C 67.
5. Provide brick similar in texture and physical properties to those available for inspection at the Architect/Engineer’s office.
6. Do not exceed variations in color and texture of samples accepted by the Architect/Engineer.

C. Facing Brick shall have the full range of brick colors mixed throughout in a uniform percentage of colors. All brick to be delivered to the site shall match throughout the project. Provide solid units, closure units, corner units and special shapes as required for the work. See drawings for special shapes required in the work.

2.04 MORTAR AND GROUT MATERIALS

A. LEED Requirements:
   1. Regional Materials - Aggregate for mortar and grout, cement, and lime shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Masonry Cement: ASTM C 91, Type S load bearing and below ground masonry. Type N for all other masonry including masonry veneer and cast stone masonry.
   1. Mortar color shall be standard gray for CMU (unless otherwise indicated), and shall match for the duration of the project.

C. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
   1. Hydrated Lime: ASTM C 207, Type S.
   2. Mortar Aggregate: ASTM C 144.
   3. Grout Aggregate: ASTM C 404.
      a. Sand: White, washed masonry sand. UNWASHED SAND WILL NOT BE ALLOWED AND WILL BE CAUSE FOR REJECTION OF WORK.

D. Water: Clean and potable.

E. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.05 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Hohmann & Barnard, Inc: www.h-b.com.
   3. Masonry Reinforcing Corporation of America: www.wirebond.com.
   4. Substitutions: See Section 01 25 00 - Substitution Procedures.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; galvanized.

C. Single Wythe Joint Reinforcement: Ladder type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483-inch side rods with 0.1483-inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

D. Multiple Wythe Joint Reinforcement: Ladder type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483-inch side rods with 0.1483-inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: Ladder type with adjustable ties or tabs spaced at 16 in on center ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.
   1. Vertical adjustment: Not less than 3-1/2 inches.
   2. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483-inch diameter.
   3. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

1. Steel frame: Crimped wire anchors for welding to frame, 0.25-inch thick, with trapezoidal wire ties 0.1875-inch-thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

2.06 FLASHINGS

A. Metal Flashing Materials: Shall be as specified in Section 07 6200.

B. Thru-wall Membrane Flashing Materials: Textroflash by Hohmann & Barnard; 40 mil thick thru-wall flashing/surface-mounted composite membrane flashing with an adhesive backing factory-laminated to a rugged, polyethylene sheeting, yielding a flexible membrane suitable for use on masonry, concrete, steel, gypsum and wood. Apply Primer-SA Hohmann & Barnard's water-based primer for self-adhering flashing on all surfaces to receive this membrane flashing. Apply in strict accordance per the membrane manufacturer's written instructions. UV resistance is for up to 120 days. The masonry contractor is to coordinate with the waterproofing contractor well in advance for the installation ALL membrane flashing.

2.07 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self-expanding; 3-inch-wide x by 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. Airspace Maintenance and Drainage Material: Polymer mesh panels for fitting between masonry ties to loosely fill masonry cavity. Installed continuous at all sills, heads, and all other horizontal conditions. Drainage Mat shall be 16" in height.
      a. Manufacturers:
         1) CavClear/Archovations, Inc; CavClear Masonry Mat: www.cavclear.com.
         2) Substitutions: See Section 01 6000 - Product Requirements.

D. Building Paper: ASTM D 226, Type I ("No.15") asphalt felt.

E. Weeps: Molded PVC grilles, insect resistant.
   1. Manufacturers:
      a. Wire-Bond; Product - #3601 Cell Vent for weep holes. Color as selected by architect, jumbo size.
      b. Williams Products, Inc.; Product - Williams-Goodco brick vent for cavity walls
      c. Substitutions: See Section 01 6000 - Product Requirements.

F. Cavity Vents: Molded PVC grilles, insect resistant.
   1. Manufacturers:
      a. Wire-Bond; Product - #3601 Cell Vent for weep holes. Color as selected by architect, jumbo size.
      b. Williams Products, Inc.; Product - Williams-Goodco brick vent for cavity walls:
      c. Substitutions: See Section 01 6000 - Product Requirements.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

A. See Structural Drawings.

2.09 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.

4. Interior, loadbearing masonry: Type N.
5. 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. Submit samples to Architect for selection.

1. Brick #1 Mortar Color – Color as selected by Architect.

Note: Mortar Color for Brick #1 shall be Argos “Khaki” for bidding purposes. Final mortar colors will be determined upon completion of the exterior wall assembly mock-up.

3. Cast Stone Mortar Color – Color as selected by Architect to match cast stone components.

Mortar shall be selected from the following mortar manufacturers:

1. Holcim (US) Inc.
2. LaFarge North America Inc.

C. Grout: ASTM C 476. 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. 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.

C. Cleaning Reinforcement: Before being placed, remove loose rust, ice and other coatings from reinforcement.

D. Wet brick with absorption rates in excess of 30 g./30 sq. in./min. (30 g./194 cm2/min.) determined by ASTM C 67, so that rate of absorption when laid does not exceed this amount.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

B. Remove all masonry deemed frozen or damaged.

C. Do not use wet or frozen CMW units.

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 (3/8").

C. Concrete Masonry Units:
   1. Bond: Running Bond
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: “Concave” Joint.

D. Brick Units:
   1. Bond: 1/3 Running Bond
   2. Coursing: Two units and two mortar joints to equal 8 inches.
   3. Mortar Joints: “Concave”.

3.05 PLACING AND BONDING

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
   1. Face Brick: Mix brick from several pallets at a time during installation.

B. Layup walls plumb and true and with courses level, accurately spaced and coordinated with other work.

C. Lay in fire rated walls with masonry units that comply with fire rating shown.

D. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Lay hollow masonry units with face shell bedding on head and bed joints.

F. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

G. Remove excess mortar and mortar smears as work progresses.

H. Interlock intersections and external corners.

I. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

J. Stop off horizontal run of masonry by racking back 1/2 length of unit in each course. Toothing is not permitted except upon written acceptance of the Architect/Engineer.

K. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

L. Cut mortar joints flush where wall tile is scheduled and other concealed locations.

M. Provide radius corner at all outside corners in the interior of the building, except first course above finish floor and top course at ceiling line shall have square corners for joints at wall base and ceiling suspension system.

N. Isolate masonry partitions from vertical structural framing members with a control joint.

O. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 MORTAR BEDDING AND JOINTING:

A. Lay brick and other solid masonry units with complete filled bed and head joint; and shove into place. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also, bed webs in mortar in starting course on footing and foundation walls and in all courses of piers, columns and pilasters and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

C. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are

required, remove units, clean off mortar and reset in fresh mortar.

D. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. Rake out mortar where applicable in preparation for application of caulking or sealants.

E. Tool all masonry joints on exposed faces. ALSO, TOOL ALL JOINTS ON OUTSIDE FACE OF THE INTERIOR WYTHE OF MASONRY WITHIN CAVITY TO RECEIVE FLUID-APPLIED AIR BARRIER MEMBRANE. JOINTS SHALL BE COMPLETELY FILLED AND TOOLED WITHOUT VOIDS.

F. Thoroughly clean all excess mortar droppings off brick ties and CMU faces prior to application of the fluid-applied air barrier membrane.

G. All surfaces will be inspected by the waterproofing contractor for acceptance prior to application of the fluid-applied air barrier membrane. Any areas or conditions of non-compliance must be corrected at the mason’s expense.

3.07 WEEPS/CAVITY VENTS

A. Install weep in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls. Weeps must be installed directly on top of flashing to avoid damming.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels, and near top of walls.

3.08 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar control panels continuously throughout exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

3.09 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Horizontal Reinforcement: Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 3/4" on exterior side of walls and 1/2" at other locations. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.10 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.11 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.12 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.

F. Keep cavity clean of mortar droppings during construction. Strike joints facing cavity flush.

3.13 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. Coordinate with waterproofing contractor to ensure proper installation locations of membrane flashings on the substrate. The waterproofing contractor will install all membrane flashings on the substrates and the masonry contractor will continue the installation within the masonry veneer.
   1. Extend flashings full width at such interruptions and at least 8 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Extend laminated flashings to within 1/4 inch of exterior face of masonry.

D. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

E. Provide surface primer at all surfaces in strict accordance with membrane flashing manufacturer’s written instructions.

3.14 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are

not scheduled.

1. Do not splice reinforcing bars.
2. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
3. Place and consolidate grout fill without displacing reinforcing.
4. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8-inch bearing on each side of opening.

3.15 GROUTED COMPONENTS

A. Grout all CMU cells solid.

B. Place reinforcement in bond beams and columns as shown on structural drawings.

C. Lap splices minimum 24 bar diameters.

D. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

E. Place and consolidate grout fill without displacing reinforcing.

F. Grout all block cores at walls where noted on drawings.

3.16 CONTROL AND EXPANSION JOINTS

A. Provide vertical expansion, control and isolation joints in masonry where shown. If not shown provide at a distance of 3 times the wall height not to exceed 35’-0” and 4’-0” off corners. In any case, consult architect before placement. Built-in related masonry accessory items as the masonry work progresses. Rake out mortar in preparation for application of sealant backing rod and sealant. Insert a build-in Styrofoam insulation board in vertical expansion joints where shown on plans. (The waterproofing contractor will install a 12” vertical strip of continuous 40 mil flash shall be placed on the cavity side of the interior wall and turned out blow floor level). CMU control joints, if indicated, are to be used as a guide only. Contractor is to coordinate with all openings and position as required.

B. Do not continue horizontal joint reinforcement through control and expansion joints.

C. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

E. Size control joint in accordance with Section 07 90 05 for sealant performance.

F. Form expansion joint as detailed.

3.17 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
   1. Fill space between hollow metal frames and masonry solidly with mortar.
   2. Leave joints around outside perimeters of aluminum storefront exterior doors, window frames and other wall openings to receive joint sealant.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.18 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and ducts. Coordinate with other sections of work to provide correct size, shape, and location.

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

3.19 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4500.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C 67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C 140 for conformance to requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.

E. Special inspections
1. Verify all reinforcement placement, including required laps, before grouting.
2. Verify that all grout placement complies with code and construction document provisions.
3. No grouting of masonry to be performed until testing laboratory has inspected re-bar placement.
4. Grout shall be sampled and tested for compressive strength per ASTM C1019.

3.20 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.
1. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Remove efflorescence prior to final acceptance of the project.
2. Clean architectural polished colored CMU masonry with clean, soft, damp rags. Wipe off at once all mortar smears and spatters. Do not allow hardening. Final clean down to be in strict accordance with block manufacturer's recommendations, including thorough rinsing. Damp-dry with clean, soft rags. Do not use acid, steel wood, or other abrasives.
3. Clean exposed brick masonry surfaces as recommended by BIA Technical Notes "Cleaning Brick Masonry". Clean exposed masonry from top down. Chemical cleaners shall be mixed and applied in accordance with the manufacturer's recommended specifications. Use of muriatic acid is prohibited.
4. BRICK: PRIOR TO APPLICATION OF CHEMICAL CLEANERS, THE EXPOSED FACE OF THE BRICK SHALL BE THOROUGHLY SATURATED WITH WATER. APPLY CHEMICAL CLEANERS IN CAREFUL ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. AFTER CLEANING OPERATIONS ARE COMPLETED, THOROUGHLY FLUSH THE FACE OF THE BRICK WITH WATER UNTIL ALL CLEANING RESIDUE HAS BEEN REMOVED.
5. PROTECT ALL ADJACENT NON-MASONRY SURFACES FROM COMING INTO CONTACT WITH CHEMICAL CLEANERS. ANY DAMAGE TO ADJACENT SURFACES SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.

D. Use non-metallic tools in cleaning operations.

3.21 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

1.0 GENERAL:

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including general and supplementary conditions and Division 1 specification sections, apply to work of this section.

ACI 530.1, Specifications for Masonry Structures

1.2 DESCRIPTION OF WORK: Extent of each type of reinforced unit masonry work is indicated on drawings and in schedules.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of manufactured material and product, including concrete block, reinforcement, reinforcement accessories, joint systems, and others if requested.

C. Shop drawings: Submit 4 copies of shop drawings for fabrication, bending and placement of reinforcement bars. Comply with ACI 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures”. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work. The shop drawings must include detailed elevations of reinforcing in order for the engineer to properly review.

D. Steel Reinforcement: Provide Mill certificates for all steel reinforcement.

E. Fire Resistance Rating Certification: Provide written certification that the concrete block provided for this project meets the requirements of the International Building Code, latest edition, for the fire resistance rated block required for the fire resistance rated assemblies for this project.

2.0 PRODUCTS:

2.1 MATERIALS:

A. General: Refer to Section “Unit Masonry” for masonry materials and accessories not included in this section.

B. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A615, except as otherwise indicated.

1. Provide Grade 60 for all reinforcing bars.
2. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

C. All CMU used for fire rated walls must meet the IBC requirements for rating of the block per 2021 IBC table 722.3.2 or be UL listed and approved for the required hourly rating of the wall as indicated on the plans.

3.0 EXECUTION:

3.1 PLACING REINFORCEMENT:

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1” (whichever is greater).

C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
1.Lap all bars as follows:

Bar SizeLap Length
#42’-0”
#52’-6”
#63’-0”

D. Vertical reinforcement shall be secured against displacement prior to grouting at intervals not exceeding 8 feet.

E. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.

3.2 INSTALLATION GENERAL:

A. Refer to Section “Unit Masonry” for general installation requirements of unit masonry.
B. Refer to masonry notes in structural drawings for additional installation requirements.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:

1. Do not wet concrete masonry units (CMU).
2. Lay CMU units with full-face shell mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8” joints.

Where solid CMU units are shown, lay full mortar bead and bed joints.

B. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum

clearance and grout coverage for vertical reinforcement bars. Keep cavities free mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement and other reinforcing bars. Place small mesh, expanded metal lath, or wire screening in mortar joints under bond beam courses over cores or cells on non-reinforced vertical cells, or provide units with solid bottoms.

C. Columns, Piers and Pilasters:

1. Use CMU units of the size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown, or not shown, alternate head joints in vertical alignment.

D. Grouting:

1. Grout shall be provided by the ready-mix concrete producer. See Section 03310 for submittal requirements. Grout shall be course grout, having a design slump of at least 4”.
2. Grout shall have a minimum 28-day compressive strength of 2500 psi. Slump shall be 8 to 11 inches. Vibrate grout to assure cells are filled solid.
3. Compressive strength of grout shall be determined by ASTM C 1019-99. One set of 4 compressive strength specimens shall be fabricated and tested for each days placement of grout, or for each 30 cubic yards of grout, whichever is less.

E. Low-Lift Grouting:

1. Provide minimum clear dimension of 2” and clear area of 8 sq. in. in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters not 8 ft.
3. Lay CMU to maximum pour height. Do not exceed 6’ height, or to include the next bond beam, whichever is less.
4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1 1/2” below top course of pour.
5. Bond Beams: Stop grout in vertical cells 1 1/2” below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. **Place grout in bond course before placing CMU**.

F. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry t ensure bond. After final cleaning and inspection, close clean out holes and brace closures to resist grout pressures.

1. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

G. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

H. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 4'. Allow not less than 30 minutes, or more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

1. Place grout in lintels or beams over openings in one continuos pour.

I. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.

J. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1 1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more ours are required.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes structural steel and architecturally exposed structural steel.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts in concrete.
2. Division 5 Section "Steel Joist Framing" for coordinating joist connections to structural steel.

1.3 SUBMITTALS

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted snug-tightened, pretensioned, or slip-critical connections.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Mill test reports certifying that structural steel complies with requirements, including chemical and physical properties.

F. Manufacturer’s certificates of compliance certifying that their products, including the following, comply with requirements.

1. Weld filler materials for both shop and field welding.
2. Twist-off type tension control bolts.
3. Nonshrink grout.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar to this Project with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to this Project and with a record of successful in-service performance. Fabricator must meet one of the following requirements:

1. A qualified fabricator who is currently certified by the AISC Quality Certification Program for Structural Steel Fabricators and is designated as AISC Certified Fabricator, Standard for Steel Building Structures.

2. Fabricator must maintain detailed written fabrication, material control, and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator’s ability to conform to approved construction documents and referenced standards.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings."
2. AISC's "Seismic Provisions for Structural Steel Buildings."
3. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. 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 deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusted before use.
2. 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.

1.6 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting templates and instructions as required for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As follows:

1. Wide Flange Shapes and Tees: ASTM A 992.
2. Other Shapes, Plates and Bars: ASTM A 36.
3. Plate Where Indicated 50 ksi: ASTM A572, Grade 50.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B or C.

C. Steel Pipe: ASTM A 53, Type E or S, Grade B.

D. Headed Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B with ceramic ferrules. Stud heights shown on the drawings are net lengths after welding. Studs used for composite beams with steel deck shall extend not less than 1½ inches above the top of the steel deck.

E. Anchor Rods, Nuts, and Washers: As follows:

1. Anchor Rods: ASTM F 1554, Grade 36.
2. Nuts: ASTM A 563, heavy hex carbon steel nuts.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Plate Washers: ASTM A 36, carbon steel plate washers in accordance with Table 14-2 of AISC's “Steel Construction Manual", Thirteenth Edition, 1/4 inch plate thickness for anchor rods up to 1 inch diameter, 3/8 inch plate thickness for anchor rods larger than 1 inch diameter.

F. High-Strength Bolts, Nuts, and Washers: As follows:

1. All bolts shall be of domestic manufacture.
2. Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts.
3. Nuts: ASTM A 563, heavy hex carbon steel nuts.
4. Washers: ASTM F 436, flat, circular carbon steel washers.
5. Twist-Off Type Tension Control Bolts: ASTM F 1852, Type 325.
6. Finish: Plain, uncoated.

G. Threaded Rods: ASTM A 36.

H. Forged Steel Hardware:

1. Clevises, Turnbuckles: AISI C 1035.
2. Clevis Pins: AISI C 1018 or AISI C 1035.
3. Eye Bolts, Eye Nuts: ASTM A 489.
4. Sleeve Nuts: AISI C 1018, Grade 2.
5. Finish: Plain, Uncoated.

I. Welding Electrodes: Comply with AWS requirements.

1. Electrodes shall be E70XX.
2. All electrodes for welding ASTM A 992 steel shall be low hydrogen electrodes with a maximum of 16 ml of diffusible hydrogen per 100 g of deposited weld metal.

3. Electrodes for all welds in moment connections, including shear tabs and stiffener plates, shall have a minimum Charpy V-Notch toughness of 20 foot-pounds at –20 degrees F, and 40 foot-pounds at 70 degrees F.

2.2 PRIMER AND PAINT

A. See the Architectural drawings and Division 9 Sections for areas which are scheduled to receive a paint topcoat and for topcoat paint systems.

B. Primer for Steel not to Receive Topcoat: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79.

C. Primer for Steel to Receive Topcoat: Comply with Division 09 painting Sections, or if not specified in Division 09 painting Sections, use the following:

1. Interior Steel: SSPC Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
2. Exterior Steel: SSPC Paint 25 BCS, Type II, zinc oxide, alkyd, linseed oil primer.

D. Primer for Steel which Receives Intumescent Paint: Use a primer which is approved by the intumescent paint supplier.

E. Primer color may be selected by contractor, however only one single color of primer may be incorporated in the Work.

F. Galvanizing Repair Paint: Conform to ASTM A 780 or Military Specification MIL-P-21035A. Acceptable products include, but are not limited to:

1. Galvacon GC-243 Cold Galvanizing Compound, Lanco.
2. Zinga, ZingaMetall.
3. Rust-Oleum Stops Rust Cold Galvanizing Spray, Rust-Oleum.
4. ZRC Cold Galvanizing Compound, ZRC Worldwide.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Five Star Grout; U.S. Grout Corp.
2. Masterflow 713; Master Builders.
3. Sonneborn Sonogrout 10K; ChemRex, Inc.
4. NS Grout, Euclid Chemical Company.
5. SC Multipurpose Grout, SpecChem, LLC.
6. Enduro 50; Conspec.

2.4 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural steel members where indicated.

2. Mark and match-mark materials for field assembly.
3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
6. Welds which will be exposed to view in the completed structure shall have a neat and uniform appearance. Such welds shall be continuous, not intermittent. Plates which are exposed to view on bottoms of beams shall be straight and aligned at joints, and shall be butt welded together at joints with all welds ground smooth.

B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale, seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

D. Headed Shear Connectors: Prepare steel surfaces as recommended by manufacturer of headed shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Joists: Coordinate requirements for support of open-web steel joists with joist supplier.

1. Where joists are supported by steel columns, or on the sides of steel beams, or are bolted to steel framing, or where stabilizer plates are required for joist bottom chords, coordinate the steel details with the joist supplier. Provide required supports, holes, and stabilizer plates as required by joist supplier.
2. Where joists are supported by sloped diagonal steel beams, coordinate the steel details with the joist supplier. Provide required plate seats on beams as required by joist supplier.

F. At roof edges where joist extensions occur to support a continuous edge angle or bent plate, extend the top portion of beams which are parallel with joists same as the adjacent joist extensions unless indicated otherwise.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.

H. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

I. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

J. Stairs: Hangers, brackets, posts and other supports for steel stairs shall be located so that they are concealed within walls or other areas not visible to view.

K. Tube Members: Provide ¾" minimum cap plates on tube columns which support beams unless otherwise indicated. Provide ¼" closure plates on ends of all other tube members unless another connection is indicated. Where the tube end is exposed to view, grind closure plate smooth and flush with tube face all around, including at curved corners of tube.

1. On tube members which will be exposed to view in the completed structure, the seam on the tube shall be oriented away from view. For columns, locate seam facing towards a wall, and for beams, locate seam on upper surface of tube unless indicated otherwise.

2.5 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Bolts: ASTM A325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as pretensioned or slip-critical.

B. Welded Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete.
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. Top flanges of beams to receive field welded headed shear connectors or field welded rebar.
6. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces as follows:

1. Steel not to Receive Topcoat: SSPC-SP 1 "Solvent Cleaning", followed by SSPC-SP 2 "Hand Tool Cleaning."
2. Interior Steel to Receive Topcoat: Comply with Division 09 painting Sections, or if not specified in Division 09 painting Sections, use SSPC-SP 1 "Solvent Cleaning", followed by SSPC-SP 2 "Hand Tool Cleaning."
3. Exterior Steel to Receive Topcoat: SSPC-SP 6 "Commercial Blast Cleaning."

4. Faying surfaces and surfaces adjacent to bolt heads and nuts shall be free of dirt and foreign material. Faying surfaces at slip-critical connections shall also be free of scale, except tight mill scale, and free of coatings, including inadvertent overspray.

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 complying with Division 09 painting Sections, but not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A123.

B. Galvanize shelf angles, steel lintels in exterior walls, and other items as indicated.

C. Where tubes or pipes in exterior elements exposed to the weather have vent holes for galvanizing, the vent holes shall be closed using plug welds and then ground smooth and flush. Holes shall be closed after galvanizing and then painted with galvanizing repair paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Where temporary shoring is required for composite deck construction, do not remove shoring until cast-in-place concrete has attained its 70 percent of its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base Plates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base plates and bearing plates for structural members on wedges, shims, or leveling nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to grouting.
3. Grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

    a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Remove welded identification tags, erection bolts and clips on all steel which will be exposed to view in the completed structure; fill holes with plug welds; and grind smooth at exposed surfaces. Remove paper tags and stickers which will interfere with or show through painting.

G. Finish sections thermally cut during erection equal to a sheared appearance.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

I. Brick shelf angles shall be welded to the supporting structure only after concrete slabs are in place.

3.4 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

1. Bolts: ASTM A325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as pretensioned or slip-critical.
3. Tensioned bolts: For bolted connections indicated as pretensioned or slip-critical, use twist-off type tension control bolts.

B. Welded Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
3. Welds which will be exposed to view in the completed structure shall have a neat and uniform appearance. Such welds shall be continuous, not intermittent. Plates which are exposed to view on bottoms of beams shall be straight and aligned at joints, and shall be butt welded together at joints with all welds ground smooth.
4. Shielded Metal Arc Welding (SMAW) or Flux Cored Arc Welding (FCAW) are acceptable welding processes for shop or field welding. FCAW-S (self-shielded) shall not be mixed with any other welding process in the same weld in moment connections.
5. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

C. Headed Shear Connectors: Weld headed shear connectors through deck to supporting members using automatic end welding according to AWS D1.1 and manufacturer's written instructions.

1. Do not use shielded metal arc welding (“stick” welding) to weld headed shear connectors unless limited access prevents using automated equipment. Where limited access prevents using automated equipment, studs may be welded by hand using a 5/16” fillet weld all around.
2. At start of each welding operation, operator shall weld two headed shear connectors and visually verify that they exhibit full 360 degree flash. Studs shall then be bent to an angle of approximately 30 degrees from vertical. Satisfactory visual and bend tests shall be obtained on two consecutive headed shear connectors before production welding commences.
3. Remove and discard ferrules after welding headed shear connectors.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field inspections and tests and to prepare test reports.

1. Special inspector will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Contractor shall ensure that no items which are to be tested or inspected are covered up by earth, concrete, deck or other materials before testing and inspection are complete.

C. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

D. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

E. Periodically inspect steel frame joint details for compliance with approved construction documents.

F. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Verify that washers are installed as required by RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

2. Snug-Tightened Connections: Visually verify that all plies of the connected elements have been brought into firm contact.
3. Slip-Critical Connections and Pretensioned connections indicated to have faying surfaces prepared as required for slip-critical connections: Prior to assembly, visually verify that faying surfaces of joints meet the requirements of RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

G. Provide continuous visual inspection of all multi-pass fillet welds, all single-pass fillet welds greater than 5/16”, and all complete and partial penetration groove welds. Provide periodic visual inspection of single-pass fillet welds less than or equal to 5/16”.

H. Field-welded headed shear connectors shall be inspected and tested according to requirements of AWS D1.1 for stud welding, proper stud height, and as follows:

1. Headed shear connectors shall be visually inspected to verify the presence of a continuous 360-degree weld flash. Bend tests will be performed by bending to an angle of 15 degrees from vertical when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any headed shear connector.
2. Ten percent of headed shear connectors, including those which do not pass the visual inspection described above and additional connectors selected at random, shall be tested by bending to an angle of 15 degrees from vertical. Connectors which pass the bend test may be left in the bent position.
3. Bend tests will be conducted on the adjacent headed shear connectors on each side when weld fracture occurs on a headed shear connector.

I. Masonry reinforcing steel which is field welded to structural steel shall be inspected as follows:

1. Verify that all reinforcing steel which is to be welded conforms to ASTM A 706.
2. At each beam or other structural steel member, the first welded reinforcing bar shall be bent to an angle of 30 degrees and then bent back into place. Before being covered with masonry, all reinforcing bars shall be hit with a hammer after welding to verify that welds do not fracture.

3.6 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 1.5 mils.

B. Galvanized Surfaces: All exposed galvanized surfaces which have been damaged by shipping, handling, welding or other operations shall be repaired. Surfaces to be repaired shall be clean, dry, and free of oil, grease, welding slag or flux and corrosion products. Apply galvanizing repair paint according to the manufacturer’s instructions to attain the required dry-film thickness.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel joists and joist accessories. The term “joist” in this section refers to open-web K-series joists, and joist substitutes.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Division 5 Section "Structural Steel Framing" for coordinating joist connections to structural steel.

1.3 SUBMITTALS

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Fabricator Qualifications: Submit documentation that the joist fabricator is a member of the Steel Joist Institute (SJI) and is certified by SJI to manufacture joists complying with SJI’s “Specifications”.

C. Product Data: For each type of joist, accessory, and product indicated, submit manufacturer’s certification of compliance with SJI’s "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications").

D. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details; bracing; bridging and bridging connections; accessories; splice and connection locations and details; and attachments to other construction. Indicate uplift loads and any other special loads for which joists are designed.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Comply with SJI’s “Specifications”.

B. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project with a record of successful in-service performance. Manufacturer must be certified by SJI to manufacture joists complying with SJI’s “Specifications”.

C. Field Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel"; and AWS D1.3 "Structural Welding Code - Sheet Steel."

D. High Strength Bolting: Comply with Research Council on Structural Connections (RCSC) “Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts.”

E. Inspection: Manufacturer shall inspect joists before shipment to ensure compliance with SJI’s “Specifications”.

F. Codes and Standards: Applicable editions of codes and standards shall be the editions specified in the Building Code edition in effect for this Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications".

B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

C. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain, uncoated.

D. Welding Electrodes: Comply with AWS standards.

2.2 PRIMER

A. Primer: Manufacturer's standard shop primer complying with performance requirements of SSPC-Paint 15.

2.3 JOISTS

A. Design and manufacture steel joists to comply with SJI’s "Specifications" and “Recommended Code of Standard Practice for Steel Joists and Joist Girders,” and the erection requirements of OSHA “Steel Erection Standard 29 CFR Part 1926.757, Open Web Steel Joists”.

1. Design joists for uniform loads indicated in the SJI Load Tables and any special loads and criteria indicated on the Drawings.

2. Design joists for the additional stresses resulting from a 300-pound concentrated load located at any location along the top and bottom chord. The 300-pound load is already accounted for in the joist designations shown on the drawings unless noted otherwise and shall be applied concurrently with the balance of the standard SJI service load.
3. Design roof joists for net uplift of 20 psf unless otherwise indicated.

B. Do not increase allowable stresses for wind load combinations.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Camber joists in accordance with SJI's "Specifications."

E. Equip bearing ends of joists with beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

F. Where joists are supported by steel columns or are bolted to steel framing, or where stabilizer plates are required for bottom chords, the manufacturer shall coordinate the details with the structural steel supplier.

G. Top Chord Extended Ends: Extend top chords where indicated. Design extended ends to support the uniform load indicated in the SJI Load Tables for the span of the joist unless a larger design load is indicated.

H. Ceiling Extensions: Provide ceiling extensions in areas having ceilings or gypsum board construction attached directly to joist bottom chords and other locations where indicated. The extension shall be of sufficient strength to support the ceiling and shall be extended to within 1/2 inch of the finished wall surface.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Bridging shall comply with OSHA "Steel Erection Standard 29 CFR Part 1926.757, Open Web Steel Joists".

1. Provide uplift bridging consisting of a single line of bottom chord bridging at the first bottom chord panel point at each end of joists on all roof joists.

2. Furnish additional erection stability bridging where required.

3. On diagonal bridging, provide bolted connections to joist chords and at intersections of bridging. Bolts shall be ASTM A 307 of size indicated in SJI "Recommended Code of Standard Practice for Steel Joists and Joist Girders."

4. Provide bolted diagonal bridging for all bridging on deep longspan joists.

5. In rows of diagonal bridging, provide horizontal bridging in end joist spaces unless otherwise indicated.

6. Ends of all bridging lines, including uplift bridging must be anchored.

B. Provide header units to support tail joists at openings not framed with structural steel shapes.

C. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from joists and accessories by hand-tool cleaning, SSPC-SP 2.

B. Apply one shop coat of primer to joists and joist accessories to provide a continuous, dry paint film thickness not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting construction, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after supporting construction is in place and secured and unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI "Specifications," joist manufacturer's field use shop drawings, and requirements in this Section, unless more stringent fastening requirements are indicated on the drawings.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately before permanently fastening.
3. Install bridging, temporary bracing, connections, and anchors to ensure that joists are stabilized during construction. Erection shall comply with OSHA “Steel Erection Standard 29 CFR Part 1926.757, Open Web Steel Joists.”
4. Where rigid connections of bottom chord extensions to columns or supports are indicated, delay making rigid connection until dead loads have been applied.

B. Field Welded End Anchorage: Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

C. Bolted End Anchorage: Provide bolted end anchorage for joists where indicated or required.

1. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.
2. Bolt joists to supporting steel framework using high-strength structural bolts where indicated. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

D. Bridging: Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at walls or beams.

1. Connect horizontal bridging to each joist and bridging anchor with a minimum 1/8” fillet weld, 1/2 inch long at K-series and KCS-series joists, and with a minimum 1/8” fillet weld, 1 inch long at longspan joists. Splice horizontal bridging with two welds as indicated above, one weld on each leg of the bridging angle. In rows of diagonal bridging, where horizontal bridging is provided in end joist spaces, weld the horizontal bridging to the bridging anchor with a minimum two 1/8” fillet welds, 1inch long, one on each side of the bridging angle.
2. On diagonal bridging, provide bolted connections as indicated in SJI “Recommended Code of Standard Practice for Steel Joists and Joist Girders.”
3. Joist bridging shall not be used to support piping, ducts, conduits, ceilings or any other item.

E. Before field painting commences, remove all joist tags and their connecting wires or strings from joists which will be exposed to view in the finished structure.

3.3 FIELD QUALITY CONTROL

A. Special Inspector: Owner will engage a special inspector to perform field quality control inspections of joist connections to the structure:

1. Visually inspect welds and weld size where joists are attached to the structure for conformance with approved shop drawings.
2. Approximately ten percent of joist connections to the structure, selected at random by the special inspector, shall be visually inspected. If unacceptable connections are found, the joist connections on the joists at each side of the unacceptable connection shall also be inspected.

B. Special inspector will report results of inspections promptly to Architect and Contractor.

C. Repair connections not in compliance with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Misfabricated or Damaged Joists: Misfabricated or damaged joists shall be replaced or repaired. Before joists are repaired, the manufacturer shall submit for review details of the proposed repair method, approved, stamped, and signed by a qualified structural engineer licensed to practice in the state where the project is located. After the repair is complete, the joist supplier shall provide a written statement verifying that the capacity of the repaired joists is at least equivalent to the originally specified joists. For joists which will be exposed to view in the final structure, the appearance of the repaired joist must be acceptable to the architect.

B. Maintain conditions that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Accessories.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel Framing" for field-welded headed shear connectors.

1.3 SUBMITTALS

A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of accessory indicated, submit details and thicknesses. For each type of deck, submit structural properties, thicknesses, and maximum unshored construction spans.

C. Underwriters' Label: Where compliance with a UL fire-rated assembly is required as indicated on the architectural drawings, provide certification that steel deck units are identical to those units tested for fire resistance per ASTM E 119 and listed in Underwriters' Laboratories "Fire Resistance Directory".

D. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing details, deck openings, special jointing, and accessories.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck installations similar to this Project with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to the Architect, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. AISI Specifications: Calculate structural properties of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

D. Underwriters' Label: Where compliance with a UL fire-rated assembly is required as indicated on the architectural drawings, provide steel deck units identical to those units tested for fire resistance per ASTM E 119 and listed in Underwriters' Laboratories "Fire Resistance Directory".

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
1. For deck profiles with field-installed insulation, protect insulation strips from moisture.

1.6 COORDINATION

A. Coordinate installation of acoustical deck containing sound-absorbing insulation strips with roofing installation to ensure protection of insulation strips against damage from effects of weather, moisture, and other causes. Do not allow insulation strips to become wet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers whose products may be included in the Work include, but are not limited to, the following:

1. New Millennium Building Systems.
2. Epic Metals Corp.
3. United Steel Deck, Inc.
4. Vulcraft, Division of Nucor.
5. Wheeling Corrugating Co.

2.2 GENERAL

A. Deck which is to receive spray-applied fireproofing shall be free of lubricants and oils which would impair the adhesion of the fireproofing. The deck manufacturer shall certify that the deck is UL classified and has been fire tested with the appropriate fireproofing material.

B. For galvanized deck which is to be field painted, contractor shall coordinate with the decking supplier prior to ordering to verify that all exposed decking schedule to be painted has a paint-compatible passivator that does not inhibit proper bonding of the paint per the painting manufacturer.

2.3 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and the following:

1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33 minimum, G60 zinc coating.
2. Deck Profile Type, Depth, Thickness and Structural Properties: As indicated on the structural drawings.
3. Side Laps: Overlapped.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Screws: Corrosion-resistant, hexagonal washer head, self-drilling carbon-steel screws.

C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33 ksi, not less than 0.0358-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

D. Welding Washers for use with Non-Composite Form Deck: Steel sheet with a minimum thickness of 0.0598 inches (16 gage), with a nominal 3/8 inch diameter hole.

E. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (14 gage) thick, of same material and finish as deck, with 3-inch-wide flanges and recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

F. Column Closures, End Closures, Z-Closures, Girder Fillers and Cover Plates: Steel sheet, of same material and finish as deck, not less than 0.0358-inch design uncoated thickness.

G. Galvanizing Repair Paint: ASTM A 780 or SPC-Paint 20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting members and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section and on the drawings.

B. Fabricate deck panels in lengths to span three or more supports where possible.

C. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

D. Locate decking bundles to prevent overloading of supporting members.

E. Place deck panels and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side-lap interlocks.

F. Place deck panels flat and square and fasten to supporting members without warp or deflection.

G. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

H. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

I. All screws should penetrate the joined materials so that there are not less than 3 exposed threads. Screws should be installed and tightened in accordance with the screw manufacturer’s recommendations.

J. Install mechanical fasteners according to deck manufacturer's instructions.

3.3 ROOF DECK INSTALLATION

A. Screw roof deck panels to all perimeter angles and to all steel supporting members with self-drilling No. 12 diameter or larger carbon-steel screws as follows:

1. Space screws 6 inches apart at each support and at entire perimeter.
2. Space screws as indicated on the structural drawings, or if not indicated, at 6 inches apart at each support and at entire perimeter.

B. At perimeter angles and steel supporting members which are too thick to fasten deck by screwing, substitute arc spot (puddle) welds of 5/8 inch minimum diameter at the same spacing as indicated for screws.

C. Side-Lap Fastening: Fasten side laps of panels between supports at intervals as indicated, but not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:

1. Mechanically fasten with No. 10 diameter or larger screws.

D. End Bearing: Install deck ends over supports with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Butt end joints in cellular deck and other deck profiles that cannot be lapped. Lap end joints of all other roof deck types 2 inches minimum.

E. Do not allow insulation in acoustical roof deck ribs to become wet or moist.

F. Miscellaneous Roof Deck Accessories: Install finish strips, cover plates, and closures according to deck manufacturer's instructions. Attach to substrate to provide a complete deck installation.

G. Roof deck shall not be used to suspend piping, ducts, conduits, ceilings or any other item.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field quality control inspections of roof deck connections:
   1. Visually inspect screw size and spacing of roof deck connections to structure.
   2. Visually inspect screw size and spacing in side laps of roof deck.

B. Special inspector will report results of inspections promptly to Architect and Contractor.

C. Provide additional connections to replace connections not in compliance with specified requirements.

3.5 REPAIRS, REINFORCEMENT AND PROTECTION

A. Galvanizing Repairs: Prepare and repair rust spots, welds, burned areas, and damaged areas of galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Reinforcement of Openings: Unless other reinforcing is shown on the structural drawings, reinforce openings with any dimension larger than 6 inches as follows

   1. Openings 6 inches to 12 inches: Reinforce with 0.0358-inch steel sheet, 6 inches wider than opening in all directions. Attach to top surface of deck with No. 10 diameter screws or welds at 6 inch spacing along each side. Attach to deck before opening is cut.
   2. Openings 12 inches to 18 inches: Reinforce with 2 inch x 2 inch x 1/4 inch steel angles. Place angles perpendicular to flutes, extended minimum two flutes each side of opening. Weld to top surface of deck with welds at 6 inch spacing along each side of angles. Attach to deck before opening is cut.
   3. Where openings are in deck supporting slabs, provide pour stops around openings in addition to reinforcing indicated above. Cut deck out of opening after concrete has been in place a minimum of seven days.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Exterior soffit and fascia framing.
5. Shear panels and holdowns.
6. Other items indicated on the structural drawings to be by the light gage framing supplier (or the synonymous term cold-formed framing supplier).

B. Related Sections include the following:

1. Division 5 Section "Structural Steel Framing" for masonry shelf angles.
2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
3. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads and Criteria: As indicated on the structural drawings.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Wall Framing: Horizontal deflection of 1/600 of the wall height for walls with brick or other masonry veneer. 1/360 for walls with other types of cladding. For purposes of deflection calculations, the wind load may be taken as 0.7 times the components and cladding 50-year wind loads in the applicable code. Strength calculations must be based on the full components and cladding 50-year wind loads.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 psf, or seismic load, whichever is greater.
c. Floor Joist Framing: Vertical deflection of 1/480 of the span for live loads and l/360 for total load.

d. Roof Rafter Framing: Vertical deflection of 1/360 of the horizontally projected span for total load.
e. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for total load.

3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
1. Expansion anchors.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Holdowns for shear panels.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

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 for this Project.

C. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

   1. Allied Studco.
   2. AllSteel Products, Inc.
   3. California Expanded Metal Products Company.
   4. Clark Steel Framing.
   5. Consolidated Fabricators Corp.; Building Products Division.
   6. Craco Metals Manufacturing, LLC.
   7. Custom Stud, Inc.
   8. Dale/Incor.
   9. Design Shapes in Steel.
   10. Dietrich Metal Framing; a Worthington Industries Company.
   11. Formetal Co. Inc. (The).
   12. Innovative Steel Systems.
   13. MarinoWare; a division of Ware Industries.
   14. Quail Run Building Materials, Inc.
   15. SCAFCO Corporation.
   16. Southeastern Stud & Components, Inc.
   17. Steel Construction Systems.
   18. Steeler, Inc.
   19. Super Stud Building Products, Inc.
   20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet at Shear Panels: ASTM A 653, ASTM A 792, or ASTM A 875, metallic coated, of grade and coating weight as follows:

   1. Grade: Structural Steel (SS) Grade 33.

2. Coating: G60.
3. Thickness: As indicated on the structural drawings.

B. Other Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage) except studs to which exterior storefront, curtain wall, or windows are attached shall be 16 gage minimum.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs. except tracks to which exterior storefront, curtain wall, or windows are attached shall be 16 gage minimum.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage)
2. Flange Width: 1-5/8 inches.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage), except studs to which exterior storefront, curtain wall, or windows are attached shall be 16 gage minimum.
2. Flange Width: 1-5/8 inches.
3. Section Properties: As required to meet the structural design criteria.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs, except tracks to which exterior storefront, curtain wall, or windows are attached shall be 16 gage minimum.
2. Flange Width: 1-1/4 inches.

2.5 SOFFIT, FASCIA, CEILING JOIST FRAMING, AND BACKUP FOR COMPOSITE METAL PANELS

A. Steel Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage), except studs and tracks to which exterior storefront, curtain wall, or windows are attached shall be 16 gage minimum.
2. Flange Width: 1-5/8 inches.
3. Section Properties: As required to meet the structural design criteria.

B. Where framing is for backup of composite metal panels, provide continuous 2” x 2” x 18 gage angles at all corners.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Hole reinforcing plates.
9. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Holdowns at Shear Panels: Provide Simpson holdown indicated or equal.

G. Welding Electrodes: Comply with AWS standards.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads. Unless larger dimensions are indicated on Shop Drawings, ¾” minimum clearance shall be maintained between screws and edges of members, and ¾” minimum on-center spacing shall be maintained between adjacent screws.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, zees, supplementary framing, or tracks to structural members indicated to receive sprayed fire-

resistive materials. The engineered shop drawings and calculations shall include the design of these members and their connections.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads. Unless larger dimensions are indicated on Shop Drawings, ¾” minimum clearance shall be maintained between screws and edges of members, and ¾” minimum on-center spacing shall be maintained between adjacent screws.

D. In multistory buildings, do not install wall studs until the concrete slabs above and below the studs have been poured.

E. Install framing members in one-piece lengths unless splice connections are indicated.

F. Install manufactured connectors in accordance with the manufacturer’s recommendations. The size and number of fasteners shall be as specified by the manufacturer.

G. Framing around openings where windows, curtain wall, storefront, and louvers in exterior walls (headers, jambs, sills) are attached shall be 16 gage minimum.

H. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

I. At exterior walls where wall stud framing is interrupted by steel beams and wall sheathing or insulation boards run continuous past the beam, provide vertical stud infill framing in the exterior sides of webs of beams at the same spacing as the wall studs. Minimum base metal thickness shall be not less than minimum base metal thickness required for exterior wall studs in this specification. Infill framing is required whether shown on the drawings or not.

J. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of expansion joints.

K. Install insulation, specified in Division 7, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

L. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

M. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches, unless indicated otherwise.

C. Set studs plumb.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads or provide additional studs as required.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced in rows not more than 48 inches apart. Fasten at each stud intersection. Use one of the following methods:

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 8 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges. Straps shall be minimum 1-1/4 inch wide and minimum 0.0329 inch (20 gage) thick.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom tracks, except where deflection tracks are used. Space studs as follows:

1. Stud Spacing: 16 inches, except where otherwise indicated or where closer spacing is required by the engineering analysis.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install headers, sills, and jamb studs at openings as required to resist wind and seismic loads and to transfer these loads to the structure.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 SOFFIT, FASCIA, AND CEILING JOIST INSTALLATION

A. Provide light gage framing for soffits, fascia, and exterior ceilings as indicated on the architectural and structural drawings. All required items may not be shown on the structural drawings.

1. Dimensions and details shall be as shown on the architectural drawings.

3.7 SHEAR PANEL INSTALLATION

A. Install steel sheets as indicated on the structural drawings. Horizontal and vertical edges between sheets shall be butted, not lapped, and shall occur over framing members. Provide horizontal blocking where horizontal joints do not occur over framing members.

B. Steel sheets shall be delivered to the site flat, not rolled. Sheets may be provided full height, with no horizontal joints, at the contractor’s option.

C. Screws for shear panels shall be minimum No. 8 modified truss head, unless a larger size is indicated on the structural drawings.

D. Install holdowns in accordance with the manufacturer’s recommendations. The size and number of fasteners shall be as specified by the manufacturer.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a special inspector to perform tests and inspections and prepare test reports.

B. Special inspector shall verify the manufacturer’s procedure for material control meets the requirements of IBC section 1704.3.

C. Special inspector shall verify in the field that the following is in accordance with the Drawings and approved shop drawings:

1. Member sizes, configurations, and spacings.
2. Connections.
3. Bracing and bridging.
4. Shear wall panel construction including holdowns.

D. Special inspector will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work where test results or inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rooftop equipment bases and support curbs.
2. Wood blocking**,** cants, and nailers.
3. Wood sleepers.
4. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all indicated rough carpentry items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all built into walls and roof that is structural in nature or as indicated on Drawings.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Eastern softwoods; No. 2 Common grade; NeLMA.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking,and similar supports to comply with requirements for attaching other construction.

B. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.2 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing and foundation wall drainage systems complete.

B. Cant strips and other accessories.

C. Drainage panels.

D. Vapor Barriers for all ground floor slabs on grade.

E. Sheet membrane waterproofing system for all walls below grade, and elsewhere as shown on drawings.

F. Sheet membrane waterproofing system for under the wood floor systems.

G. Sheet membrane waterproofing system for elevator pits, stage perimeter walls, walls at change in floor slab heights and other wall areas inside of the building exterior below grade that are not indicated to connect to the storm drain

H. Liquid Elastomeric waterproofing membrane at interior side of interior and exterior raised planters.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-In-Place Concrete: Concrete substrate.

B. Section 04 2000 - Unit Masonry: Masonry substrate.

C. Section 31 2000 - Earthwork:

D. Section 31 2333 - Trenching and Backfilling: Backfilling and compacting.

E. Section 33 4600 - Subdrainage: Retaining wall subdrainage system and foundation wall drainage information.

1.03 REFERENCE STANDARDS

A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 2006a.

B. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2005).

C. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

1.04 SUBMITTALS

A. See Section 01-3300 - Submittal Procedures.

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, protection board, drain mat, piping to storm drain and any other materials or system components required for a COMPLETE system.

C. Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

E. Warranty:

1. Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

2. Submit two copies of warranty for the waterproofing work agreeing to repair or replace the system components which leak water, deteriorates excessively or otherwise fails to

perform as required within the warranty period due to failure of materials of workmanship. By terms of warranty, also agree to remove and replace other work which has been superimposed on the waterproofing work. Warranty shall be signed by Contractor and by the Installer. Warranty shall be for a period of two years from date of substantial completion of the project.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with ten (10) years' experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years' experience in similar work and approved by the manufacturer.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.08 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

B. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

C. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.09 WARRANTY

A. See Section 01 7839 - Project Record Documents for additional warranty requirements.

B. Contractor shall correct defective Work within a five (5) year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner. This no cost replacement of any landscaping or plantings shall provide plantings of same size as those removed if directed by owner or architect.

C. Provide five (5) year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

D. The Contractor and Installer shall warrant the waterproofing work agreeing to repair or replace the system components which leak water, deteriorates excessively or otherwise fails to perform as required within the warranty period due to failure of materials of workmanship. By terms of warranty, also agree to remove and replace other work which has been superimposed on the waterproofing work. Warranty shall be signed by Contractor and by the Installer. Warranty shall

be for a period of two years from date of substantial completion of the project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Laminated Composite Manufacturers:
   1. Grace Construction Products; Product Bituthene 4000 System: www.na.graceconstruction.com.
   2. Polyguard Products, Inc; Product: Polyguard 650 System: www.polyguardproducts.com.
   3. W.R. Meadows, Inc; Product Mel Rol System: www.wrmeadows.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MEMBRANE MATERIALS

A. Membrane shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Composite Laminate Membrane: Comprised of 1.4mm (0.056 inch) (thickness of rubberized asphalt and a thickness of 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner.; 0.060-inch total thickness. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.
   1. Flexibility: 180-degree bend over 1-inch mandrel at -45 degrees F in accordance with ASTM D 1970 - Unaffected.
   2. Tensile Strength: 325 psi, measured in accordance with ASTM D 412.
   3. Ultimate Elongation: 300 percent, measured in accordance with ASTM D 412.
   4. Crack Cycling at -25 degrees F, 100 cycles, in accordance with ASTM C 836 - Unaffected
   5. Lap Adhesion at minimum application temperature: 5 lbs/in in accordance with ASTM D 1876.
   6. Peel Strength: 9 lbs/in in accordance with ASTM D 903.
   7. Puncture Resistance, Membrane: 50 lbs minimum in accordance with ASTM E 154.
   8. Resistance to Hydrostatic Head: 231 ft of water in accordance with ASTM D 5385.
   9. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D 570, 24-hour immersion.
   10. Water Vapor Permeability: 0.05 perm inch, measured in accordance with ASTM E 96/E 96M.

C. Seaming Materials: As recommended by membrane manufacturer.

D. Membrane Sealant: As recommended by membrane manufacturer.

E. Surface Conditioner, Mastic and Liquid membrane: As recommended by manufacturer, compatible with membrane.

F. Liquid Membrane at planters: Masterseal HLM 5000R (roller applied) elastomeric waterproofing liquid membrane by BASF or equal.

2.03 ACCESSORIES

A. Drainage Panel: 0.433-inch-thick geo-composite drainage sheet system consisting of a hollow studded polystyrene core, covered on one side with a nonwoven, needle punched polypropylene filter fabric and on the other side with a smooth polymeric film, designed to promote positive drainage while serving as a protection course. Hydroduct 220 manufactured by Grace Construction Products or approved equal.
   1. Drainage panel shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
   2. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Cant Strips: Pre-molded composition material.

C. Tape and accessories: Products acceptable to manufacturer of sheet membrane waterproofing.

D. Waterstop: See Section 03 3000 - Cast-In-Place Concrete.

E. Drain pipe for tying into nearest storm drain shall be as recommended by drainage system manufacturer to ensure a “complete” system. See section 33 4600 for additional information.

2.04 VAPOR BARRIERS

A. Membrane under all floor slabs on grade shall be VaporBlock 15 Class “A” by Raven Industries, StegoWrap 15 Class “A”, or approved equal. All joints shall be lapped 6 inches minimum and sealed with 4” wide Vapor Bond Tape as supplied by the membrane manufacturer. Membrane shall be turned up to the top of slab, adhered to foundation walls and shall be sealed around all pipe, conduits or other penetrations. Membrane shall not be penetrated with concrete slab screed stakes. Immediately before concrete placement final inspection shall be required and any holes, misaligned seams or wrinkled seams, or other irregularities shall be patched with membrane and mastic.

The vapor barrier must have a new material permeance of less than 0.01 Perms as tested in accordance with ASTM E 1745 Section 7 and have strength in accordance with ASTM E 1745 Class A, "Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs." Thickness must be 15 mils. Tape, mastic and all other system components must be provided by the vapor barrier membrane manufacturer in order to obtain the manufacturer’s warranty.

In addition to the above, the vapor barrier shall have Permeance after ASTM E 154, Sections 8, 11, 12 and 13 mandatory conditioning tests: less than 0.01 Perms

Install vapor barrier in accordance with manufacturer’s written instructions and ASTM E 1643.

Warranty: The Contractor and Installer shall warrant the waterproofing work agreeing to repair or replace the system components which leak water, deteriorates excessively or otherwise fails to perform as required within the warranty period due to failure of materials of workmanship. By terms of warranty, also agree to remove and replace other work which has been superimposed on the waterproofing work. Warranty shall be signed by Contractor and by the Installer. Warranty shall be for a period of two years from date of substantial completion of the project.

3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

D. Proceed with waterproofing work only after substrate construction and penetrating work have been completed.

E. Installer shall examine substrate and conditions under which waterproofing work is to be performed and notify contractor in writing, of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall

be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Seal cracks and joints with sealant using depth to width ratio in accordance with Section 07 9005.

E. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

F. Cast-In-Place Concrete Substrates
   1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
   2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
   3. Repair bugholes over 13 mm (0.5 in.) in length and 6 mm (0.25 in.) deep and finish flush with surrounding surface.
   4. Remove scaling to sound, unaffected concrete and repair exposed area.
   5. Grind irregular construction joints to suitable flush surface.

G. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing and waterproofing systems in accordance with manufacturer's written instructions.

B. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.

C. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.

D. Seal daily terminations with troweled bead of mastic.

E. Roll out membrane. Minimize wrinkles and bubbles.

F. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

G. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

H. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

I. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

J. Coordinate with drain installation; see Section 33 4600 – Subdrainage for additional information.

K. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.

L. Seal membrane and flashings to adjoining surfaces. Install counterflashing over all exposed edges.

3.04 INSTALLATION - DRAINAGE PANEL

A. Place drainage panel directly against membrane, butt joints, place to encourage drainage

downward. Scribe and cut boards around projections, penetrations, and interruptions.

B. Adhere drainage panel to substrate with compatible adhesive.

C. Drainage panels and foundation drainage systems must include the system manufacturer's drainage piping components tied to the nearest storm drain in order for the drainage "SYSTEM" to be complete.

3.05 FIELD QUALITY CONTROL

A. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.

B. Flood to minimum depth of 12 inch with clean water. After 48 hours, inspect for leaks.

C. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test. Repair damage to building.

D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

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

3.07 CLEANING AND PROTECTION

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closed Cell Spray Polyurethane Foam (SPF) Cavity Wall Insulation.

1.2 RELATED SECTIONS

A. Section 04 2000 - Unit Masonry assemblies: Cavity wall assemblies.

B. Section 04 2000 - Unit Masonry assemblies: Thru-wall and surface mount membrane flashing.

C. Section 04 2731 – Reinforced Unit Masonry.

D. Section 04 7200 - Masonry Mortar and Grout: Product requirements for Mortar and grout.

E. Section 05 1200 - Structural Steel Framing: Product requirements for steel anchors.

F. Section 05 5000 - Metal Fabrications: Product requirements for loose steel lintels.

G. Section 07 6200 - Sheet Metal Flashing and Trim: Requirements for flashings.

H. Section 07 8400 - Firestopping: Firestopping at penetrations of masonry work.

I. Section 07 9005 - Joint Sealers: Rod and sealant at control and expansion joints.

1.3 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials.

C. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

D. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

E. ASTM E 119 – Standard Test Method for Fire Test of Building Construction and Materials

J. AATCC 127 - Water Resistance: Hydrostatic Pressure Test.

K. NFPA 285 – Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus

1.4 SUBMITTALS

A. Submit under provisions of Section 01 3300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

4. Sample of Manufacturers one- year material warranty.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing polyurethane foam products and systems of this section with minimum ten years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.

1. Installer must be an NCFI GoldStarSM certified insulation contractor or have manufacturer's certification for the application.

2. Installer shall provide the equipment required by the manufacturer for proper installation including high pressure plural component proportioning pump, heated hoses of suitable length, spray gun, drum pumps or other material feeding system, and other ancillary equipment required for the Work.

C. Membrane Flashing Installation prior to application of spray foam system: The spray foam contractor is to coordinate with the waterproofing contractor well in advance for the installation ALL membrane flashing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage for the chemicals should be between 65°F and 80°F for proper processing through the spray equipment. Chemicals shipped during winter or summer months may need extra time in moderate temperature storage to stabilize back in the proper application range. Cold chemicals can cause poor mixing, pump cavitation or other process problems due to higher viscosity at lower temperatures. Storing chemicals above 90°F should be avoided as much as possible. Excessively warm chemicals should be cooled prior to opening the drums. Do not store in direct sunlight. Keep drums tightly closed when not in use and under dry air or nitrogen pressure of 2-3 psi after they have been opened.

B. Store and dispose of solvent-based materials, and materials used with solvent- based materials, in accordance with requirements of local authorities having jurisdiction.

C. Mock-Up: Provide SPF application to wall mock-up specified under masonry. Provide insulation for evaluation of surface preparation techniques and application workmanship. Panel approximate size will be 15’ x 10’.

1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship is approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

4. Accepted mock-ups shall be comparison standard for remaining Work

1.7 PRE-INSTALLATION MEETINGS

A. Convene pre-installation meeting a minimum of two weeks prior to commencing work of this section.

B. Attendance: Architect, General Contractor, waterproofing contractor, mason/wall finish applicator and SPF applicator.

C. Agenda: Review installation sequence, safety requirements, warranty requirements, inspections and application procedures, and scheduling.

1.8 COORDINATION

A. Ensure that the installation of products of this section is coordinated with affected trades to prevent interruption of construction progress.

B. Spray foam contractor is responsible for reviewing all conditions and surfaces prior to spraying to ensure that the area is ready to spray. By spraying any area, the spray foam applicator accepts that all conditions and surfaces are ready to spray.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not install spray polyurethane foam during precipitation or when precipitation is imminent. Do not install when the ambient temperature is less than authorized by the manufacturer application guidelines or without specific authorization of the manufacturer. Do not install when the ambient humidity exceeds the manufacturer's limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. NCFI Polyurethanes, which is located at: 1515 Carter Street P. O. Box 1528; Mount Airy, NC 27030-1528; Toll Free Tel: 800-346-8229; Tel: 336-789-9161; Email: request info (info@ncfi.net); Web: www.ncfi.com (Basis of Specification)

B. BASF Corporation WALLTITE® spray-applied polyurethane foam insulating air barrier system

C. JM Corbond III® closed-cell spray polyurethane foam (SPF) insulating air barrier system

2.2 MATERIALS

A. Spray Polyurethane Foam (SPF) Cavity Wall Insulation: NCFI's InsulBloc closed cell spray-in-place polyurethane foam (SPF) insulation:

1. Physical Properties:

a. Core Density: 1.9 to 2.2 lbs/ft3 when tested in accordance with ASTM D 1622.

b. Water Vapor Transmission: Less than or equal to 1.0 perms at 2 inches thick when tested in accordance with ASTM E 96.

c. Compressive Strength: 20 psi minimum when tested in accordance with ASTM D 1621.

d. Flame Spread: Equal to or less than 25 when tested in accordance with ASTM E 84.

e. Smoke Developed: Equal to or less than 450 when tested in accordance with ASTM E 84.

f. Air Leakage: 0.004 CF /min/SF at 1.57 psf cfm/sf when tested in accordance with ASTM E 283 or ASTM 2178.

g. Certified as Water Resistive Barrier per - AATCC 127 and ASTM E331.

h. Potential Heat value per NFPA 259

i. Report tested and approved substrates and exterior covering materials per NFPA 285 testing

j. Report Fire Resistive Wall Assembly rating per ASTM E 119 (as required by design)

2. R-Value: R-Value when tested in accordance with ASTM C 518.

a. R-Value: 13. Thickness 2 inches (51 mm). Insulation Thickness Tolerances are – ¼” to + ½”.

2.3 MISCELLANEOUS MATERIALS

A. Foam Repair Kit: Foam Repair Kit: Handi-Foam two-part kits from Fomo Products, or Touchn'Seal 2 component systems from Convenience Products, or equivalent kits.

B. Mineral Wool: Delta Safing Mineral Wool Board, 4 lb./cu. ft. density, manufactured by Rock Wool Manufacturing Co., Leeds, AL or equivalent.

C. Moisture Detection Paper (MDP) Strips: MDP Strips manufactured by NCFI Polyurethanes, Mount Airy, NC.

D. Thru-wall Membrane Flashing Materials: Textroflash by Hohmann & Barnard; 40 mil thick thru-wall flashing/surface-mounted composite membrane flashing with an adhesive backing factory-laminated to a rugged, polyethylene sheeting, yielding a flexible membrane suitable for use on masonry, concrete, steel, gypsum and wood. Apply Primer-SA Hohmann & Barnard's water-based primer for self-adhering flashing on all surfaces to receive this membrane flashing. Apply in strict accordance per the membrane manufacturer's written instructions. UV resistance is for up to 120 days. The spray foam contractor is to coordinate with the waterproofing contractor and masonry well in advance for the installation ALL membrane flashing.

E. Other approved air barrier transition materials as approved by NCFI Polyurethanes and the architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Review NCFI Product Stewardship Manual for ventilation and Personal Protective Equipment requirements and ensure unauthorized workers are not in the area during the spray foam application

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Proceed with spray polyurethane foam application only after substrate construction, substrate penetration work, and related welding and other hot work has been completed.

E. Verify that mortar has cured sufficiently for all masonry substrates and is dry by checking surface for moisture with Moisture Detection Paper (MDP) strips.

F. Gaps in junctions of wall materials wider than 2" shall be covered with approved transition membrane or backer fill material and liquid applied flashing membrane (Prosoco Fast Flash).

G. Fill voids between masonry and structural steel greater than 2 inches (51 mm), with mineral wool or a backer gypsum board cut to fit in the void, and then spray over the backer material.

H. On metal stud/GWB wall assemblies install transition membranes around corners at window/door openings and around wall penetration for plumbing and electrical conduit as stipulated in design details.

I. For applications to CMU, concrete or masonry base walls, use transition membranes to seal junctions of dissimilar materials, such as window framing. Do not apply transition membranes at wall corners or changes of plane where the masonry/concrete construction is continuous. Backer material covered with transition membrane can be used to bridge between two masonry/concrete walls constructed independent of each other.

J. Mask adjacent materials as needed to prevent overspray.

K. Review NCFI Product Stewardship Manual for ventilation and Personal Protective Equipment requirements and ensure unauthorized workers are not in the area during the spray foam application.

L. Cordon off area for spray foam application and post warning signs as necessary to prevent entry to the area by other persons not wearing appropriate Personal Protective Equipment (PPE).

3.3 INSTALLATION

A. Apply SPF directly to the masonry block, concrete or exterior gypsum wall board in accordance to the manufacturer's installation instructions. Multiple layers of foam may be applied as required to achieve the required thickness. Total thickness to any area must be applied on the same day.

B. All surfaces to be sprayed with SPF must be free of all forms of moisture and ice. Surfaces shall be checked with NCFI's MDP (Moisture Detection Paper) strips prior to and during foam application.

C. Do not apply SPF during inclement weather or when ambient temperature and humidity are outside the ranges prescribed by the manufacturer.

D. Apply the SPF to an average thickness indicated on the Drawings or specified in the schedule at the end of this section. Minimum thickness of SPF will be as indicated in the following table:

R-Value of Insulation	Average Thickness (inches)	Minimum Thickness (inches)
6.8	1	¾
9.6	1½	1¼
13	2	1½
16	2½	2
19	3	2½

E. Excess thickness permitted up to point it does not interfere with the installation of the veneer system. The required 1” air space between the SPF surface and the back side

of the veneer must be maintained for at least 90% of the wall area. Excess thickness may be trimmed or sanded from the SPF surface.

F. Remove overspray from adjacent surfaces.

G. Where damage occurs, which violates the SPF's air seal and moisture seal, repair as needed using the specified spray polyurethane material or the specified foam repair kit material.

H. If additional SPF layer is required to achieve the minimum thickness on days after the initial foam application, the area must be cleaned of any substance that may hinder proper adhesion of the new layer of foam (dust, dirt, water, etc.). High pressure air, spray water wash or physical brushing may be used as determined by the spray foam contractor to accomplish the cleaning.

3.4 PROTECTION

A. Protect installed SPF until closure or completion of wall surfaces.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 CLEANING

A. Remove excess insulation.

B. Replace defective insulation.

C. Clean soiled surfaces with cleaning solution.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing Insulation for the Modified Bitumen roofing system specified for this project.

B. Loose lay gypsum substrate (only at hourly rated assemblies); mechanically attach base layer of polyisocyanurate insulation to steel deck; adhere second layer of polyisocyanurate insulation in foam adhesive; adhere tapered insulation crickets in foam adhesive where indicated in Contract Drawings; adhere overlayment insulation in foam adhesive. Locations of rated roof and roof/ceiling assemblies are indicated on the drawings.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section, including but not limited to:

A. Steel Roof Deck Section 05 3100
B. Rough Carpentry Section 06 1000
C. Modified Bitumen Roofing Section 07 5216

1.03 REFERENCES

A. Refer to the following references for specification compliance:

1. 2021 South Carolina Building Code
2. National Roofing Contractors Association – NRCA
3. FM Global
4. Underwriters Laboratories, Inc. – UL
5. ASHRAE Standard 90.1

1.04 DESCRIPTION

A. R Value

1. The minimum thickness for the above deck base insulation system shall be 4” minimum (LTTR Value = R25) and in accordance with the current Energy Conservation Code and ASHRAE 90.1.
2. R value to be based on Long-Term Thermal Resistance (LTTR) for polyisocyanurate insulation and manufacturer’s published data for all other insulation components, as tested in accordance with ASTM C177, C236, C518 or C976.

1.05 SUBMITTALS

A. Refer to Section 01 3300-Submittal Procedures for requirements.

B. Manufacturer’s Product Data Sheets for all materials specified certifying material complies with all specified requirements.

C. Tapered insulation plan from material supplier with minimum R-value for each roof area.

D. Latest edition of the Manufacturer's current material specifications and installation instructions.

E. Fastening shall be indicated on the roofing shop drawings by roofing manufacturer based on project requirements.

1.06 QUALITY ASSURANCE

A. Insulation to be installed in accordance with their respective manufacturer's requirements.

B. Insulation(s) not bearing UL label at point of delivery shall be rejected.

C. Insulation damaged or wetted before, during, or after installation shall be removed from the job site no later than the next working day from the day such damage or moisture contamination is noted.

D. Wind Design: Install insulation system to meet the required wind uplift pressures as specified in Sections 07 5216 and 07 5400.

E. Insulation Securement:
Steel Deck Fasteners: Screws and metal plates shall be tested and approved in compliance with Factory Mutual standard 4470 and listed in the current FM Approval Guide as such.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Material shall be delivered in the manufacturer's original sealed and labeled shrouds and in quantities to allow continuity application.

B. Storage: Materials shall be stored out of direct exposure to the elements on pallets or dunnage at least 4 inches above ground level at site location acceptable to Owner.

1. Utilize tarps that will completely cover materials to prevent moisture contamination. Remove or slit factory shrouds and/or visqueen; do not use these materials as tarps.
2. When storing on the ground, store in areas on top of a continuous vapor barrier or other means to prevent potential damage due to moisture from below.
3. Store materials on a clean flat surface.
4. Remove damaged or deteriorated materials from the job site.

C. Handling:

1. Material shall be handled in such a manner to preclude damage and contamination with moisture or foreign matter.
2. Use caution when loading gypsum or any other materials to avoid damage to roof decking or to cause any deflection.

1.08 PROJECT CONDITIONS

A. Insulation shall not be applied during precipitation. Contractor assumes all responsibility for starting installation in the event there is a probability of precipitation occurring during application.

B. Contractor will take necessary action to restrict dust, and debris from entering the structure.

C. No more insulation shall be installed each day than can be covered with membrane and base flashings in the same day to create a watertight installation.

1.09 WARRANTY

A. All roof insulation products, fasteners, adhesives shall be included in the roof system manufacturer's warranty specified in Section 07 5216.

PART 2 PRODUCTS

2.01 MATERIALS

A. Insulation Boards:

1. Gypsum Substrate: Shall be nonstructural, glass mat faced gypsum panel with 500 psi moisture resistant treated core, non-asphaltic primer surfacing, and tested in accordance with ASTM E 84 and ASTM E 136. The board must be listed in the U.L. assembly being used for the rated roof construction. Board Size shall be 4' by 8' and thickness shall be 5/8", Type X. Acceptable manufacturers include:

   a. GP Gypsum DensDeck
   b. USG Securock
   c. DEXcell Glass Mat Roof Board

2. Polyisocyanurate Insulation: Shall be rigid polyisocyanurate roof insulation board with factory applied coated polymer bonded glass fiber mat facers on the top and bottom. Boards to comply with ASTM C1289 Type II, Class 2, Grade 2 and meet the following requirements:

   a. Curing time shall be 24 hours minimum, plus an additional 24 hours minimum per inch thickness, at a minimum of 60 degrees F before shipment from the manufacturer.
   b. Dimensional stability shall be 2 percent maximum linear change when conditioned at 158 degrees F and 97 percent relative humidity for seven days.
   c. Maximum permissible insulation board size for mechanical attachment is 4' x 8' and for foam adhesive and hot asphalt attachment is 4' x 4'. Field cutting of larger boards is not acceptable.
   d. Minimum two layers of polyisocyanurate, with maximum thickness of 2" per layer, to be provided with thickness as necessary to meet or exceed the specified minimum R-value.

   Acceptable manufacturers include:

   1. Atlas
   2. Hunter
   3. Johns Manville (JM)

3. Tapered Insulation Crickets: Shall be rigid polyisocyanurate roof insulation board meeting the above requirements for Polyisocyanurate Insulation and as follows:

    a. Board size shall be 4 foot by 4 foot.
    b. Slope shall be 1/2” per foot and minimum thickness shall be ½”.
    c. Fill Insulation: Shall be rigid polyisocyanurate meeting the above requirements with board size of 4 foot by 4 foot and thickness of 2”.

4. Overlayment Insulation: Shall be cover board approved by roof system manufacturer. Board Size shall be 4’ by 8’ and minimum thickness shall be as determined by roofing manufacturer for wind uplift requirements and project conditions. Acceptable products include:

    a. Georgia Pacific DensDeck Prime Roof Board
    b. USG Securock Glass-Mat Roof Board
    c. Soprema Sopraboard

5. Asphalt impregnated wood fiber tapered edge strips and cant strips to be the sizes detailed or required by field conditions meeting ASTM C 208.

    a. Tapered Edge Strips:

        i. Shall be installed at edges to make transitions as detailed in Contract Drawings.
        ii. Use 1/2" by 6" tapered edge strips in front of tapered insulation crickets to provide smooth transition.

    b. Walls and vertical terminations to receive 4" vertical leg cant strip with 5-5/8” face unless height restrictions dictate smaller sizes.

B. Insulation Attachment Materials:

1. Steel Deck Mechanical Fasteners and Stress Plates: Shall be corrosion resistant 3” galvalume stress plate and corrosion resistant screw type fasteners for use with steel decks; approved by the insulation manufacturer for the insulation type, thickness and board size specified; fastener length as required by the fastener manufacturer for the insulation thickness specified, and to penetrate the deck a minimum of 3/4 inch and a maximum of 1 inch.
2. Foam Adhesive: Shall be a two part, VOC compliant, polyurethane foamable adhesive designed as roof insulation adhesive and approved by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor to inspect substrate for obvious defects and notify the owner’s 3rd party roofing inspector and the Architect in writing of any deficiencies. No work shall commence until decking substrate has been inspected and accepted per written reports by the owner’s 3rd party roofing inspector.

B. Commencement of work signifies General Contractor's acceptance of substrate. Any defects in roofing work resulting from such accepted substrates shall be corrected, re-inspected and accepted per written reports by the owner's 3rd party roofing inspector at no additional expense.

C. Quality Control by the General Contractor and all sub-contractors is required.

3.02 PREPARATION

A. General

1. Roof deck to be dry and broomed clean of debris and foreign matter prior to installation of insulation system.

3.03 APPLICATION

A. General

1. Application shall be in accordance with the insulation/membrane manufacturer's instructions and these specifications. Insulation installation shall be in compliance with the intent of FM 1-90 uplift. Additional fasteners at perimeters and corners are required per the intent of FM I-28 publication."
2. All insulation to be in full sheets, carefully fitted and pushed against adjoining sheets to form tight joints. Gaps exceeding 1/4 inch will not be accepted.
3. Insulation and overlayment boards that must be cut to fit shall be saw cut or knife-cut in a straight line, not broken. Chalk lines shall be used to cut insulation. Uneven or broken edges are not acceptable.
4. Remove insulation dust and debris that develops during insulation cutting operations.
5. Joints between successive and adjacent layers of insulation to be offset a minimum of six (6") inches.
6. Stagger joints of gypsum overlayment/overlayment insulation one (1') foot (vertically and laterally) to ensure that joints do not coincide with joints from the previous or adjacent layer.
7. On steel decks, apply insulation boards with long dimension of units across deck ribs. Ends of insulation boards must be bearing on top flange of steel deck.
8. Crickets, saddles and tapered edge strips shall be installed before the overlayment insulation.
9. Adhere cant strips and tapered edge strips at transitions, terminations and/or penetrations as detailed or required in ribbons of foam adhesive to ensure smooth transitions are provided for the roof membrane and flashings.
10. Provide necessary modifications to insulation system or nailers at roof edges as required to ensure a flush and smooth transition is provided for the roof membrane and flashing.
11. Field modifications of insulation, tapered insulation, tapered edge strips and cants shall be made by the Contractor where required to accommodate roof and flashing conditions, prevent water dams and ponding water. Ponding water at scuppers and cricket valleys shall not be accepted.
12. Provide necessary modifications to prevent standing water which is defined as 1/4" of water in a 4 square foot or larger area 24 hours or more after precipitation.
13. Coordinate decking conditions with General Contractor Do not accept substrates if deflection exist in the substrates.

B. Tapered Insulation

1. Install tapered insulation system to provide positive slope for complete roof drainage.
2. Crickets shall be sized as shown in the Contract Drawings. Modifications shall be provided to ensure positive slope and prevent standing water along the cricket valley.

    a. Minimum length to width ratio shall be 2:1. Fabricate partial crickets with dimensions which would result in a minimum length to width ratio of 2:1 if they were extended to full size.
    b. Unless otherwise noted, fabricate all crickets from tapered stock as required to provide the specified minimum slope. For example, when roof slope is indicated as 1/4” per foot minimum, fabricate crickets with slope of 1/2” per foot minimum.
    c. Construct crickets on up slope side of all curbs to ensure positive drainage.
    d. Install tapered edge strips at cricket edges to provide a smooth transition between the cricket and insulation system below.

3. Insulation boards may require mechanical fasteners and stress plates at slope transition of crickets to minimize bridging.

C. Roof Drainage:

1. Drainage sumps shall be installed as detailed.
2. The Contractor shall be responsible for carefully laying out the tapered insulation, sumps, drain bowls and scuppers to ensure the finished roof provides complete drainage with no standing water.
3. Contractor shall fabricate miter-cut sumps at scuppers to provide smooth transitions between the insulation system and the drains/scuppers.
4. Sumps shall ensure complete roof drainage and prevent water dams.
5. Contractor shall adjust insulation, drains and scuppers to ensure complete roof drainage and satisfactory substrates for membrane and flashings.
6. Drain sump components shall be fastened to the deck using specified insulation fasteners or adhesives.
7. Circular sumps and sumps that do not provide smooth transition or that create standing water at the drains shall be rejected and shall require removal and replacement.

D. Insulation Mechanical Attachment

1. Fastener quantity and spacing shall be as determined by the roofing manufacturer based on project requirements.
2. Fasteners shall be installed using manufacturer’s recommended equipment and in accordance with the manufacturer’s requirements.
3. Fasteners and stress plates shall be set secure and tight against the insulation surface, and shall not be over-driven.
4. Fasteners shall engage the top flange of steel decks only.
5. Note: The membrane system is to be isolated from any mechanical attachments.”

E. Foam Adhesive Application

1. Comply with the requirements of the membrane manufacturer's tested assembly for adhesive spacing and positioning.
2. Adhesive beads shall be sized in accordance with the adhesive manufacturer's guidelines.
3. Insulation boards shall be placed onto the beads and immediately "walked" and/or "weighted" into place. Insulation boards must be placed into the adhesive in strict accordance with the adhesive manufacturer's guidelines.
4. Ensure full adhesion of all layers of insulation and take whatever steps necessary to achieve full adhesion, including but not limited to temporary ballasting of insulation until adhesive sets.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide an SBS modified bituminous membrane system consisting of two plies of asphalt elastomeric membrane reinforced with polyester and/or fiberglass mat.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section, including but not limited to:

Steel Roof Deck	Section 05 3100
Rough Carpentry	Section 06 1000
Roof Insulation	Section 07 2216
Sheet Metal Flashing and Trim	Section 07 6200
Roof Accessories	Section 07 7200

1.03 REFERENCES

A. Refer to the following references, current edition for specification compliance:

2021 International Building Code with South Carolina Amendments
National Roofing Contractors Association – NRCA

a. NRCA Roofing and Waterproofing Manual

ASTM International

b. ASTM D 41 Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
c. ASTM E 108 Standard Test Methods for Fire Tests of Roof Coverings
d. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction Materials.
e. ASTM D 3019 Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos Fibered and Non Asbestos Fibered.
f. ASTM D 3409 Standard Test Method for Adhesion of Asphalt-Roof Cement to Damp, Wet, or Underwater Surfaces.
g. ASTM D 4479 Standard Specification for Asphalt Roof Coatings – Asbestos Free.
h. ASTM D 4586 Specification for Asphalt Roofing Cement, Asbestos Free.
i. ASTM D 6162 Specification for SBS Modified Bitumen Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
j. ASTM D 6163 Specification for SBS Modified Bitumen Sheet Materials Using Glass Fiber Reinforcements.
k. ASTM D 6164 Specification for SBS Modified Bitumen Sheet Materials Using Polyester Reinforcements.

Asphalt Roofing Manufacturers Association – ARMA

FM Global

l. FM 4450 – Approval Standard for Class 1 Insulated Steel Deck Roofs
m. FM 4470 – Approval Standard for Class 1 Roof Coverings

Underwriters Laboratories, Inc. – UL

n. UL 580 – Test for Uplift Resistance of Roof Assemblies
o. UL 790 – Tests for Fire Resistance of Roof Covering Materials
p. UL 1897 – Uplift Resistance for Roof Covering Systems

1.04 SUBMITTALS

A. Refer to Section 01 3300-Submittal Procedures for Submittals.

B. Latest edition of the Manufacturer's current material specifications and installation instructions.

C. Manufacturer's Product Data Sheets for all materials specified certifying material complies with all specified requirements.

D. Submit documentation of approved, tested roof system to meet the specified requirements for the following:

Wind uplift pressures
UL Fire Resistance Rating

E. Certified Roofing Torch Applicator (CERTA) credentials from NRCA.

F. Manufacturer's written certification of installers. Certification by roofing manufacturer's other than that being used on this project is not acceptable.

1.05 QUALITY ASSURANCE

A. Roofing applicator shall be approved by the material manufacturer. Additionally, roofing applicator shall have the experience of 5 similar roof projects. Verification shall be provided to the Architect or Engineer (Owner's Third Party Envelope Inspector) upon request or with the submittal package. Whichever comes first.

B. Install roofing system to meet UL 790 Class A/ASTM E 108 Class A Fire Rating.

C. Wind Design: Install roofing system to meet or exceed the requirements of the current adopted version of ASCE-7, and shall be an approved assembly tested to the wind uplift pressures. Pressures shall be as determined by the roofing manufacturer per project requirements.

D. Manufacturer shall have been producing modified bitumen products in the United States for a minimum of 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years without a change in the basic product design or SBS modified bitumen blend (e.g. no substantive changes in product composition, polymer specification, asphalt or filler formulation).

E. The base ply and flashing reinforcing ply shall be fully inspected by the owner's 3rd party roofing inspector and periodically as described below by the manufacturer's technical

representative, and repaired and prepared to meet the Manufacturer's requirements prior to installing the surface ply.

F. The base ply shall not be exposed for longer than the manufacturer's maximum requirement for exposure and shall be acceptable for surface ply applications. Any base ply exposed longer than the maximum requirement will be subject to rejection or additional remedial requirements prior to application of the surface ply.

G. General Contractor is responsible for coordination and phasing of roofing installation with roofing contractor to avoid damage to any roofing system installation by adjacent construction work.

H. The Owner shall employ a third party inspector (Engineer/Roofing Consultant) to verify that roof materials and installation meet specifications, roofing practices and other requirements associated with the roof warranty. Copies of this report shall be distributed to the manufacturer, installer and architect. Reinspection(s) by the third party inspector shall be required if needed at no additional cost to the owner. The third party inspector shall be:

1. REI Engineers
   Jeremiah Webster
   1927 JN Pease Pl, Suite 201
   Charlotte, NC 28262
   Tel: 704-596-0331; Fax: 704-596-0533

2.The above company shall be at the pre-roofing conference and shall make inspections once a week or as determined by the owner's 3rd party roofing inspector when roofing work is in progress. The 25%, 50%, 75% and final inspections shall coincide with the manufacturer's inspections. The architect must also be present at these inspections. Notify the architect ten (10) days prior to inspection dates.

1.06 PRE-ROOFING CONFERENCE

A. Hold roofing pre-construction conference at the project site, not more than one week prior to beginning roofing and scheduled at least two weeks in advance. The roofing system submittal and shop drawing process must be 100% complete including review and return to the contractor from the architect, roofing consultant and any other party prior to the Pre-roofing Conference.

B. Attendance is mandatory for: roofing sub-contractor, roofing foreman, contractor's superintendent, roofing manufacturer's representative, architect's representative and owner's roofing consultant., Owner's representative, mechanical subcontractor, sheet metal subcontractor, and anyone else responsible for items penetrating or in contact with roof.

C. Agenda:

1. Review in detail Architect's specifications, roof plans and all roof and flashing details.

2. If a manufacturer's specification is used, review and resolve all deviations or differences from the Architect's specifications.

3. Review and understand Factory Mutual and Underwriters Laboratories

requirements and resolve all conflicts between FM or UL specifications and the Architect's/manufacturer's specifications.

4. Review roof plans for slope, deck type, drainage, membrane attachment, expansion joints, flashing and details. Resolve all conflicts regarding what is considered good roofing practice and the specifications.

5. Review proposed roofing system and recommended work practices for its installation.

6. Study all plans to determine whether different roof areas have different requirements.

7. Designate which areas on site will be available for use as storage and working areas.

8. Review procedures to be followed to provide proper protection of roof system during and after construction of roof.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery. Materials shall be delivered in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Store materials out of direct exposure to the elements on pallets at least 4 inches above ground level at site location acceptable to the Owner.

Storage trailers are acceptable provided they are equipped with a lock and located at a site location acceptable to the Owner.

Utilize tarps that will completely cover materials to prevent moisture contamination. Remove or slit factory shrouds and/or visqueen; do not use these materials as tarps.

When storing on the ground, store in areas on top of a continuous vapor barrier or other means to prevent potential damage due to moisture from below.

Store roll goods on end on a clean flat surface.
Remove damaged or deteriorated materials from the job site.

C. Handling. Material shall be handled in such manner as to preclude damage and contamination with moisture or foreign matter.

1.08 PROJECT CONDITIONS

A. Environmental Requirements

Roofing shall not be applied during precipitation and shall not be started in the event there is a probability of precipitation during applications.

The membrane shall not be applied at or below the dew point temperature.

When conditions are damp and where adjacent roof areas have moisture or dew, the roof shall be fully dried to prevent tracking water over the membrane substrates.

At ambient temperatures of 40°F and below, including wind chill, take all precautions to ensure all adhesives and other materials maintain the minimum acceptable temperature at the point of roofing application as recommended by the membrane manufacturer.

B. Protection

Protect against staining and mechanical damage of adjacent surfaces and work areas during application. Staining, mechanical damage, or discoloration of the membrane shall be cause for rejection.

Post a fire watch on site for a minimum of sixty (60) minutes subsequent to the completion of any open flame activities. Sufficient number of fire extinguishers to handle any contingency which might develop are to be on the roof at all times. The roofing applicators shall be trained in the proper use of fire extinguishers. Extinguish torches when not in use.

Prevent smoke and other fumes from entering facility by coordinating with Facility representative and by temporary intake shut down and/or covering intake.

Protect materials being installed and storage of materials against wind related damage.

Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A protection layer of plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.

1.09 TORCH OPERATION AND SAFETY

A. List requirements for torch operation and safety and hot work permit.

1.10 WARRANTY

A. Manufacturer’s standard form, non-pro-rated, without monetary limitation or deductibles, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks or breaches in the primary roof membrane causing moisture to enter the substrate below (even if visible leaks are not observed inside the facility). Warranty to remain in effect for wind speeds up to 74 mph. Warranties requiring the Owner’s signature will not be acceptable.

Warranty to include but not be limited to membrane, insulation, base sheet, mastics, adhesives, fasteners, sealants, base flashings, etc.

Warranty Period: Twenty years from date of Substantial Completion

B. Provide Installer's Guarantee of all working roof against failure for two (2) years. Installer will be responsible for all materials and labor as required to perform any correct work. All work must be in accordance with the roofing manufacturer's written instructions in order to maintain the manufacturer's No Dollar Limit Guarantee. Guarantee to run from date of substantial completion for the entire project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements herein, the following manufacturers are approved:

Siplast

Soprema, Inc.

Johns Manville (JM)

2.02 MEMBRANE MATERIALS

A. Roof Membrane Assembly:

A dimensionally stable roof membrane assembly consisting of 2 plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane secured to a prepared substrate. Both reinforcement mats shall be impregnated and coated each side with a high quality SBS modified bitumen blend.

The roof system shall pass ASTM D 5849, Resistance to Cyclic Joint Displacement at 14°F. Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles as manufactured and 200 cycles after heat conditioning according to ASTM D 5147.

Base Ply Membrane: Glass fiber and/or polyester reinforced ply sheet manufactured for torch application, meeting or exceeding requirements of ASTM D 6163 or D 6164, Type I or II, Grade S.

a. Siplast Paradiene 20 TG
b. Soprema Elastophene Flam
c. JM Dynaweld 180 S Base Sheet

Surface Ply Membrane: Glass fiber and/or polyester reinforced ply sheet manufactured for torch application, meeting or exceeding requirements of ASTM D 6163 or D6164, Type I or II, Grade G. Granules to be white.

d. Siplast Paradiene 30 FR TG
e. Soprema Elastophene Flam FR GR
f. JM Dynaweld Cap 180 FR

B. Base Flashing shall consist of a minimum of two plies (reinforcing ply followed by flashing ply):

Reinforcing/Stripping Ply:

a. Siplast Paradiene 20 TG
b. Soprema Sopralene Flam 180
c. JM Dynaweld Base Sheet

Flashing/Target Ply:

d. Siplast Parafor 50 LT
e. Soprema 180 Flam GR
f. JM Dynaweld Cap 180 FR

Stripping Ply: Shall be same as Reinforcing Ply.

Target Play: Shall be same as Flashing Ply

C. Fluid Applied Flashing System: Shall be membrane manufacturer's polyurethane based resin with polyester fleece flashing system.

Siplast Parapro

Soprema Alsan RS

JM Permaflash

2.03 RELATED MATERIALS

A. Asphalt primer: Shall meet ASTM D-41 requirements and be approved for intended use by membrane manufacturer.

B. Utility Roof Cement: An asphalt cutback general utility mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges and temporary seals conforming to ASTM D 4586 Type II requirements.

C. Sealant: An SBS polymer modified asphaltic flashing cement in a 10.4 ounce cartridge conforming to ASTM 4586 requirements approved by the roofing membrane manufacturer for use in conjunction with the roofing membrane materials.

D. Ceramic granules: Shall be of color scheme matching the granule surfacing of the cap sheet comparable to No. 11 granules.

E. Walk Pad Material: Shall be a prefabricated (by the membrane manufacturer), puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic granule wearing surface.

F. Expansion Joints: Provide roofing manufacturer's standard water tight expansion joint unless otherwise indicated.

2.04 FASTENERS

A. Base Flashing Fasteners (Wood): Shall be galvanized ring shank nail with one inch diameter cap, such as Regular Round Head Fasteners as manufactured by Simplex

Nails. Fastener length shall be one inch minimum and must be approved by the membrane manufacturer for inclusion in warranty.

B. Base Flashing Fasteners (Concrete/Masonry): Shall be 1/4” diameter metal based expansion anchor for use in concrete or masonry substrates with length to penetrate substrate a minimum of 1-1/2”.

C. Base Flashing Fasteners (Steel): #12 stainless steel, 5/16 HWH with length to penetrate substrate a minimum of 1-1/2”. Provide with bonded EPDM washer.

D. Termination Bar: 1/8" X 1" stainless steel flat bar with pre-drilled oversized or slotted holes 8" on center.

PART 3 EXECUTION

3.01 INSPECTION

A. A pre-job conference shall be conducted as described above prior to the application of the roofing.

B. Contractor shall verify that work penetrating the roof deck or work which may otherwise affect the roofing has been properly completed.

C. Contractor shall inspect insulation system substrate prior to application of membrane. Commencement of work signifies Contractor's acceptance of substrate. Any defects in roofing work resulting from such accepted substrates shall be corrected to Owner's satisfaction at no additional expense.

3.02 PREPARATION

A. General. All surfaces shall be swept or vacuumed prior to commencement of roofing.

B. All membranes shall be unrolled and allowed to relax in accordance with membrane manufacturer's recommendations or a minimum of thirty minutes, whichever is greater.

C. Where walls, curbs, expansion joints, etc. present an unacceptable substrate for flashing and where flashings substrates are combustible, a layer of non-combustible overlayment insulation shall be fastened to provide a suitable substrate for flashing.

3.03 APPLICATION

A. General:

Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of the roofing membrane base ply shall immediately follow application of base sheet/insulation system as a continuous operation. Any phasing must also be acceptable to the roofing manufacturer in order to maintain all warranty conditions.

Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize manufacturer’s recommended application techniques, apply the specified materials (i.e. granules, etc.), and exercise care in

ensuring that the finished application is acceptable to the Owner. Excessive footprints or impressions in the surface ply will be grounds for rejection thereby requiring complete membrane tear-off and replacement.

Priming:

a. Prime metal flanges, concrete and masonry surfaces with a uniform coating of asphalt primer.
b. Primer shall provide full coverage to ensure surfaces are dark brown to black. No less than 1 to 1-1/4 gallons per square will be accepted.
c. Allow primer to fully dry prior to application of asphalt/adhesive.

Inspect membrane and flashing application each day. Repair all deficiencies daily prior to beginning or resuming other work.

d. Membrane deficiencies shall be cut open and removed as necessary.
e. Repairs shall extend from lap to lap.

B. Roof Membrane:

Apply membrane in accordance with the manufacturer's instructions and the following requirements.

Apply all layers of roofing free of wrinkles, creases or fishmouths.

Exert sufficient pressure by use of roller or broom on the roll during application to ensure prevention of air pockets.

Stagger the lap seams between the base ply layer and the finish ply layer.

Apply all layers of roofing perpendicular to the slope of the deck.

Fully bond the base ply to the prepared substrate, utilizing minimum 3-inch side and end laps. Apply each sheet directly behind the torch applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.

Fully bond the surface ply to the base ply, utilizing minimum 3-inch side and end laps. Apply each sheet directly behind the torch applicator. Stagger end laps of the surface ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the surface ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the surface ply a minimum 3 feet from end laps in the underlying base ply.

C. Torch Application:

Utilize heat welders experienced in torch application.

Warm the surface to which the membrane is being applied, preheat portions of the roll which are about to be applied and melt the modified asphalt on the back of the sheet which will be used to adhere the membrane. The area of the roll where the

modified asphalt is being melted is the most critical. Roll must be heated evenly across the entire width of the sheet being heat welded.

Ensure a small bead of asphalt precedes the roll as it is laid down. Bead of asphalt shall be visible to the applicator and should flow out on both sides of the sheet.

D. Granule Embedment: Embed granules at all locations where membrane material will be installed over a granulated surface and a selvage edge is not present. Using a torch or embedment tool, heat the area and push the granules down into the heated bitumen. Do not scrape or remove the granules from the surface.

E. Water cut-off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

F. Flashings: Shall be installed concurrently with the membrane installation.

Prior to installing flashings over plywood substrates, install a layer of rosin paper and base sheet. Secure materials to plywood with approved fasteners at 6” on center staggered in all directions.

Base flashing shall be accomplished using a reinforcing ply and flashing ply. The reinforcing sheet shall be lapped a minimum of three (3) inches to itself and shall extend a minimum of four (4) inches onto the base ply surface from the base of the cant and a minimum of three (3) inches up the vertical termination above the toe of the cant. The flashing sheet shall be lapped a minimum of three (3) inches to itself and shall extend a minimum of six (6) inches from the toe of the cant onto the surface ply surface and a minimum of three (3) inches up the vertical termination above the toe of the cant or as noted in the detail drawings. Lap seams in the reinforcing layer shall never coincide with the laps of the flashing layer. All flashing sheets shall be cut off the end of the roll and be applied vertically, always working to a selvage edge.

Base flashing shall be mechanically terminated a minimum of eight (8) inches above the finished roof surface.

a. Wood Substrate: Base flashing shall be mechanically terminated using approved fasteners eight (8) inches on center. Fastener heads shall be covered with a three-course roof cement and fabric.
b. Concrete/Masonry Substrate: Base flashing shall be mechanically terminated using approved fasteners and termination bar.
c. Gypsum Sheathing Substrate over Metal Stud Wall: Provide 3” wide by 20-ga. galvanized steel behind top edge of base flashing termination secured to metal studs. Base flashing shall be mechanically terminated using approved fasteners at 8” o.c. and termination bar into metal strip.

Base flashing shall be terminated at all roof edges by extending the base flashing at least two inches beyond the edge of the roof and mechanically attaching a termination bar vertically with appropriate fasteners eight inches on center. Provide a continuous bead of sealant along outside edge of termination bar.

Sheet metal incorporated into the roofing system shall be sealed off with stripping ply. Stripping plies shall be installed in roof cement and fit tight to the edge of the sheet metal. The stripping ply shall extend four inches beyond sheet metal onto roof membrane. Stripping ply shall be installed prior to application of surface ply.

Provide sealant installed to fill void between edge of sheet metal and surface ply edge (i.e. at metal edge, pipe penetrations, etc.) properly tooled to ensure adhesion and slope to shed water. Broadcast granules into properly installed sealant.

Fluid Applied Flashing Application

Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.

Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.

Refer to manufacturer's installation instructions for application rates and additional installation information.

Broadcast granules into horizontal surface of fluid to match adjacent surface ply.

G. Walk Pad Material

Apply walk pad material to a clean, dry surface.

Prior to application, cut walk pad material into maximum 5' lengths and allow to relax until flat. A straight edge or chalk line should be used to ensure straight square cuts. Do not cut the walk pad material directly on the roof surface.

Position walk pad material so as to leave minimum 2" gaps between panels to allow for proper drainage.

Adhere walk pad panels to surface ply with roof cement applied to the back of the panels in spots approximately 5" square. Use a notched trowel to keep the cement 3/8" thick.

Walk-in each panel to ensure complete contact with the membrane surface.

Provide 5' wide walk pads around perimeter of all roof top mechanical equipment.

H. Ponding Water

1. T

he ponding of any water on the roof surface after installation of the roofing system is not acceptable and will be grounds for rejection of the roof. Ponding is herein defined as precipitation remaining in a four square foot area or larger, 1/4 inch or deeper for a period of 24 hours from the termination of precipitation. Contractor shall not apply surface ply until verification of proper drainage has been determined. Verification must be obtained without the use of water or flooding the surface. Contractor shall be responsible for modifications to roof system to ensure proper drainage including but not limited to reinstallation of roof system,

installation of additional tapered insulation and/or installation of additional base plies.

3.04 CLEAN UP

A. Remove all debris and excess material from the roof area. Pick-up all loose fasteners and sheet metal scraps.

B. The Contractor shall clean off/remove excess adhesive, sealant, stains and residue on the membrane and flashing surfaces.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counter flashings, and metal cap flashing.

B. Gutters and Supports, Downspout, Outspouts.

C. Gravel stops

D. Reglets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Through-wall metal flashings and membrane through-wall flashing for use in masonry.

B. Section 06 1000 - Rough Carpentry: Wood nailers.

C. Section 07 2129 – Closed Cell Foamed-in-Place insulation system: Through-wall membrane flashings in masonry.

D. Section 07 4113 - Metal Roof Panels: Additional flashings associated with Metal Roofing.

E. Section 07 5216 - Modified Bitumen Roofing: Additional flashings associated with Built-up Roofing.

G. Section 07 7200 - Roof Accessories: Roof-mounted units.

H. Section 07 9005 - Joint Sealers.

I. Section 08 4500 – Insulated Translucent Fiberglass Sandwich Panel Wall & Roof Assemblies

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; latest edition.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

C. ANSI/SPRI ES-1 - American National Standard for Edge Systems used with Low Slope Roof Systems.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

E. ASTM B 32 - Standard Specification for Solder Metal; 2008.

F. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

G. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

H. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2009.

I. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2003 (Reapproved 2009).

J. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.

K. ASTM D 4479 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007.

L. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007.

M. NRCA Roofing and Waterproofing Manual, fifth edition.

N. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Selection Samples; Submit as follows:

1. Submit two samples, 6" x 6" in size of each available metal finish color.
2. Manufactured items: 1'-0" length in style and finishes specified.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and the NRCA Roofing and Waterproofing Manual and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

C. All flashing, sheet metal, gutters and downspouts, and other flashings associated with roofing work and Translucent Roof Assemblies shall be provided and installed by roofing contractor and included in the roofing warranty.

1.06 PERFORMANCE

A. Coordinate the work with other work for the correct sequencing of items which make up the entire membrane of system of weatherproofing and waterproofing and rain drainage.

B. It is required that the flashing and sheet metal work be permanently watertight and not deteriorate in excess of manufacturer's published limitations.

C. Sheet metal flashing and trim shall withstand wind loads, structural movement, thermally induced movement and exposure to weather without failing.

1.07 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.

C. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Reject damaged material and remove from project site.

1.08 WARRANTY

A. Finish shall be guaranteed against fading, color change, chalking, peeling, cracking, chipping or delaminating for a period of 20 years.

B. Flashing shall be guaranteed against water tightness and included in the roofing warranty. See Section 07 5216 - Modified Bitumen Roofing and Section 07 4113 - Metal Roof Panels.

C. Warrant other flashing and sheet metal work to be free of defects in materials and workmanship. Warranty period shall be two years.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Architectural Metals: Shall be .040 pre-finished aluminum by the same manufacturer supplying metal roofing specified in Section 07 4113 where shown on plans and as required for details. Colors shall be selected by the architect.

B. Steel Sheet (Galvalume): Aluminum-zinc alloy-coated SS (structural steel) sheet conforming to ASTM A 792/A 792M; minimum AZ55 coating.
   b. Steel Thickness: Minimum 24 gauge, 0.024 inch.

C. Pre-Finished Galvanized Steel: (At all exposed flashing) ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.0276 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. Metal flashing associated with metal roofing shall match metal roofing panels.
   3. 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.
      a. Sheet metal shall be supplied by Metal Roof Panels contractor by same manufacturer as Metal Wall Panels as specified in Section 07 4113.

D. Lead: ASTM B 749, 2.5 lb/sq ft thick.

E. Copper: ASTM B370, cold rolled 22 oz/sq ft thick; natural finish.

F. Aluminum: ASTM B 209; .040 inch thick or as indicated on drawings and elsewhere in the specifications.

2.02 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.

B. Sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work: Matching or compatible with material being installed, noncorrosive, size and gage required for performance.

C. Underlayment: ASTM D 226, organic roofing felt, Type II ("No. 30").

D. Slip Sheet: Rosin sized building paper.

E. Primer: Zinc chromate type.

F. Protective Backing Paint: Asphaltic mastic, ASTM D 4479 Type I.

G. Bituminous Coating: FS TT C 494, or Mil C 18480, or SSPC Paint 12, cold applied bituminous mastic, compounded for 15 mil dry film-thickness coatings.

H. Sealant: See Section 07900.

I. Plastic Cement: ASTM D 4586, Type I.

J. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape; Springlok Flashing System, Type SM manufactured by Fry Reglet or approved equal.

K. Solder: ASTM B 32; Sn50 (50/50) type.

2.03 FABRICATION

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal

Manual", NRCA Roofing and Waterproofing Manual, and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems. Form sheet metal work with clear, sharp and uniform arises.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams for non-moving seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams. Fill seams with exterior sealant as specified in Section 07 9005 Joint Sealers.

F. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards. Sealant shall be installed in such a manner to be protected from UV deterioration.

G. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

J. Fabricate flashings to allow toe to extend 2 inches over roofing cap sheet. Return and brake edges.

K. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

L. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

M. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

N. Cap Flashing: Provide sheet metal cap flashing at top edges of base flashings and as shown on drawings.

O. Parapet Cap: Parapet cap shall be 24 gauge galvanized steel. Cap shall be installed in 12' long lengths minimum with butt type joints. Furnish a 6" joint plate to provide positive expansion and contraction. Provisions shall be made for concealed anchorage of the face of the cap with continuous hold-down clips. All corners shall be pre-fabricated to insure water tight joints. All caps to be set straight and true.

P. Gravel Stops: Galvanized steel gravel stops shall be 24 gauge thick of size and shape detailed. Finish to match exposed flashing as specified herein.
   1. Provide gravel stops and fascia at exposed edges of all built-up roofs as indicated on the drawings. Gravel stops and fascia shall be formed from 8 to 10 foot sheets of sheet metal as long as possible with no more than one piece less than 10' long in a single run.
   2. One flange shall be formed to extend not less than 6" on to the roof. Do not face nail

gravel stops.

3. The top of the gravel stop shall extend not less than 1" in height above the level of the built-up roofing. The bottom of the fascia portion shall have 3/4" fold bent outward at a 45 degree angle and shall be hooked over a previously installed continuous edge strip fabricated from 24 gage galvanized steel.
4. End joints shall lap 3" with the back member taper cut.
5. The lap of the roof and the gravel stop shall be coated with non-hardening mastic. A minimum allowance of 1/4" per 10 foot length must be made for expansion.
6. Cover plate expansion joints formed to the exact profile of gravel stop and fascia may be used.

Q. Counterflashings: Solder all seams. Provide circular copper covers soldered and mechanically attached to all penetrations. Covers shall extend 2" beyond all edges.

R. Pitch Pockets: If required on drawings, shall be manufactured of 22 oz. copper in size as required for conditions. Solder all seams.

S. Pitch Pocket Hats: Shall be fabricated of 22 ounce copper. Attached with pop rivets and seal joints. Provide for all new and existing pitch pockets. Covers shall extend 2" beyond all edges.

T. Curb Flashing: At unexposed locations, 22 oz copper where noted on drawings. Solder all seams.

U. Plumbing Vents: Shall be of 4 lb. lead turned into vent 1" minimum.

V. Scuppers: Roof Scuppers and Overflows, where indicated, shall be manufactured of 12 Ga. stainless steel as shown on plans. All seams shall be welded for water tightness. Prime prior to flashing with roofing felts. Wrap exposed stainless steel with metal matching parapet caps or brick color as determined by the Architect.

W. Miscellaneous Exposed Flashing: Shall be match exposed flashing as specified herein.

X. Reglets: Reglets shall be Fry Reglet Springlok Flashing System, Type SM snap lock, as shown on plans or approved equal.

Y. Slip Sheet: 5 lb/square red rosin building paper conforming to FS UU-B-790, Type I, Style 1b.

Z. Fasteners: Same material or compatible with sheet metal being fastened. Provide type, length and gauge recommended by the producer of the metal sheets. Fasteners shall not invalidate finish warranty.
   1. Nails: Flathead, needle point, not less than 12 ga. and of sufficient length to penetrate substrate 1" minimum.
   2. Expansion Shields: Lead or bronze sleeves.
   3. Screws: Self-tapping type, with round heads.
   4. Bolts: Furnished complete with nuts and washers.
   5. Rivets: Round head, solid shank.
   6. Blind Clips and Cleats: Same gauge as sheet metal.
   7. Termination Bar: 1" high, continuous.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: Reference Standard: SMACNA Architectural Sheet Metal Manual, Profile as indicated on drawings. Gutters and brackets including radius gutters will be custom size and profile aluminum gutters and brackets by W.P. Hickman Company (828-274-4000) or approved equal.

   1. Gutters and Brackets to be .125 aluminum unless noted otherwise in details.

   2. 1” wide .050” thick internal aluminum stap 30” o c. with continuous .125 thick external hanger at bottom (see Details)

   3. Include expansion joints not exceeding 40 feet maximum for long runs, locations recommended by manufacturer and approved by architect.

B. Downspouts: Rectangular profile. Provide 3 downspout straps per 10' section.

C. Outspouts: Fully welded into the gutter profile as noted on drawings

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: For Straight Run Gutters Exterior and Interior
   3. Downspout Supports: Brackets.

E. Exterior Finish: Kynar-500 from manufacturer's full range of colors. Color as selected by architect. Finish color at components adjacent to translucent wall and roof panels are to match the Kynar-500 metalic finish and color of the roof and wall panel frame and trim.

E. Splash Pans: Same metal type as downspouts, formed to 12" x 30" inches size; rolled sides of 1 inch high for inverted pan placement.

F. Downspout Boots: Cast iron as indicated on plumbing documents. Coordinate downspout tie-in with plumbing and civil.

G. Seal metal joints.

2.05 PARAPET COVER FABRICATION

A. Parapet Covers: Reference Standard: SMACNA Architectural Sheet Metal Manual, Profile as indicated on drawings. Shall be .040 (or heavier as required for ANSI/SPRI ES-1 compliance) pre-finished aluminum by the same manufacturer supplying metal roofing specified in Section 07 4113. Joint covers of same metal shall have a 40 mil Perma-ply membrane strip below them fully adhered to parapet covers in addition to caulk. The covers shall be anchored at the prescribed rate to achieve wind uplift resistance and in accordance with the wind uplift requirements of IBC 2021 Section 1504.

Provide coping assembly that is fabricated and installed in accordance with wind loads as indicated for this project and tested for resistance in accordance with ANSI/SPRI ES-1. Contractor is to provide details and calculations, including required performance data, of parapet copings and other applicable edge conditions as part of the submittal package. The parapet coping assembly fabricator of must be an NRCA member that is sub-listed with the NRCA to fabricate such ES-1 tested compliant products.

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.

C. Do not proceed until unsatisfactory conditions have been corrected. Commencement of the work of this section shall indicate acceptance of substrate.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

D. Underlayment: Where metal is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of 15 lb. Roofing felt.

3.03 INSTALLATION

A. Roofing Contractor shall supervise the installation of counter flashings, metal reglets, nailing strips, roofing penetrations and all other miscellaneous flashing or work that will be in contact with the built-up roofing or preformed metal roofing. Isolate dissimilar metals in contact with each other with a layer of felt or by a coating of plastic cement. Separate aluminum work from dissimilar metals, wood and from cementitious materials with a 15 mil dry film thickness bituminous coating to either the substrate or to aluminum.

B. Conform to drawing details, approved shop drawings, and standard details from SMACNA Architectural Sheet Metal Manual or NRCA Roofing and Waterproofing Manual.
   1. Counter Flashings: SMACNA Architectural Sheet Metal Manual, Detail 4-4C.
   2. Roof Penetration Flashing: SMACNA Architectural Sheet Metal Manual, Detail 4-14B.
   3. All Roof Edge Flashing and Trim: ANSI/SPRI ES-1

C. Underlayment: Where metal is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of 15 lb. Roofing felt.

D. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

E. Secure flashings in place using concealed fasteners for all flashings exposed to view. Use exposed fasteners only where permitted.(at concealed locations).
   1. Secure sheet metal items using continuous cleats, clips and blind fasteners as indicated.

F. Apply plastic cement compound between metal flashings and felt flashings.

G. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

H. All metal flashing, counterflashing, pitch pans, and reglets shall be formed on a bending brake. Shaping, trimming and hand seaming is to be done on a bench, insofar as is practical with the proper sheet metal working tools. Angles, bends and folds, which are interlocking the metal, shall be made with allowances for expansion and contraction to avoid buckling and/or fullness.

I. Counterflashing: Extend into the wall as shown and turned up and shall extend down face of wall overlapping the base flashing 4" and end laps shall be at least 4". Butter all joints. Install counter flashings in reglets or receivers. Secure in a waterproof manner.

J. Perform field joining of lengths as specified for shop fabrication. Factory form and join interior and exterior corners and similar transactions.

K. Seaming: Form seams in direction of flow. Seams shall be flatlock with cleats filled with exterior sealant. Lap seams occurring in members sloping 45° or more 4" minimum and bed in flashing cement.

L. Install exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

M. Seal metal joints watertight.

N. Secure gutters and downspouts in place using concealed fasteners.

O. Slope gutters 1/4 inch per foot minimum.

P. Connect downspouts to downspout boots where shown on drawings. Grout connection watertight.

Q. Set splash pans under downspouts.

3.04 SOLDER JOINTS

A. Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work:
   1. Do not solder aluminum.
   2. Pretinning is not required for the following metals:
      a. Lead.
      b. Lead-coated copper.
      c. Terne-coated stainless steel.
   3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.06 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4001, 01 4523 along with product related sections for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements. See Section 07 5216 - Modified Bitumen Roofing and Section 07 4113 - Metal Roof Panels for additional quality control requirements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Downspout Splash Blocks

B. Roof hatches, roof hatch rail and ladder-assist posts are to be from a single source manufacturer.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

B. Shop Drawings: For roof accessories.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Provide manufacturer’s standard warranty as indicated on the products listed in the specification.

PART 2 - PRODUCTS

2.1 DOWNSPOUT SPLASH BLOCKS

A. Downspout Splash Blocks shall be provided for downspouts except those to be tied into storm drainage system including those at high roof to low roof areas. Splash blocks shall be pre-cast concrete.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.

D. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

F. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.

4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.

C. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

Periodic

PART 1 GENERAL

A. Work includes sealing and caulking of joints where indicated on drawings, specified herein, and where required for a complete weather tight installation.

1.01 SECTION INCLUDES: Typical locations include, but are not necessarily limited to, the following:

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Applications include:
1. General Caulking (door frames, windows, other openings, etc.)
2. Exterior and interior perimeter of hollow metal door frames.
3. Exterior and interior perimeter of Aluminum Entrances, Curtain Wall, and Storefront Work.
4. Exterior wall joints
5. Control and expansion joints
6. Flashing and coping joints
7. Joints in precast concrete
8. Interior wall and ceiling joints
9. Where one partition or wall abuts another and is not structurally bonded.
10. Joints between dissimilar materials

1.02 RELATED REQUIREMENTS:

A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders:

C. Section 07 8400 - Firestopping and Smoke Seals: Firestopping sealants.

D. Section 08 8000 - Glazing: Glazing sealants and accessories.

E. Section 09 2116 - Gypsum Board Assemblies

F. Section 09 3000 - Tiling: Sealant used as tile grout.

1.03 REFERENCE STANDARDS:

A. ASTM C 834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 2008.

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2010.

D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 DEFINITIONS:

A. Sealant: A weatherproof elastomer used in filling and sealing joints, having properties of adhesion, cohesion, extendibility under tension, compressibility and recovery; shall be designed to make joints air and water tight. Material is designed generally for application to joints at exterior of structures and for other joints subject to movement.

B. Caulking Compound: A material used in filling joints and seams, having properties of adhesion and cohesion; shall not be required to have extensibility and recovery properties, usually applied to joints at interior of structures.

C. Caulk: The process of filling joints, without regard to type of material.

D. Joint Failure: A caulked joint exhibiting one or more of the following characteristics:
   1. Leaks air and/or water
   2. Sealant migrates
   3. Sealant loses adhesion
   4. Sealant loses cohesion
   5. Sealant does not cure
   6. Sealant discolors
   7. Sealant stains on adjacent work
   8. Sealant develop bubbles, air pockets or voids

1.05 SUBMITTALS:

A. See Section 01 3300 - Submittal Procedures.

B. Product Data: Submit two copies of manufacturer's specifications, recommendations and installation instructions for sealant and associated miscellaneous material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that material complies with requirements and is intended generally for applications shown. Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability. Show by transmittal that one copy of each recommendation and instruction has been distributed to Installer.

C. Approval of Applicator: A letter certifying that applicator is approved at the time of bidding by manufacturer.

D. Color Samples:

   1. Submit two samples, 1/4 x 2 inch in size of manufacturer's standard and special colors as indicated at least 30 days prior to commencement of application.
   2. Samples shall be actual materials or literature depicting actual material colors. Architect reserves the right to reject work not in conformance with selected colors, based upon samples submitted.
   3. Should Contractor select a manufacturer meeting specified requirements, except for minimum color range requirements, he shall be responsible for furnishing special colors within range requirements. Special colors shall be submitted for Architect's acceptance.

E. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

F. Qualification Data: Submit applicator's qualifications, including reference projects of similar size, scope and complexity, with current phone numbers and contact names of architects, contractors and owners for verification.

G. Warranty: A warranty from the applicator upon completion guaranteeing the water tightness of the sealant installation for a period of five (5) years assuming responsibility for prompt and complete repair of any leaks occurring during this period. In addition, provide a letter on the manufacturer’s letterhead at project close-out stating that work has been accomplished in accord with this specification and with manufacturer's application directive.

1.06 QUALITY ASSURANCE:

A. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized

limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials with workmanship.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by the sealant manufacturer.

1.07 DELIVERY AND STORAGE:

A. Store in sealed and labeled containers. Containers shall bear the date of packaging the physical and chemical characteristics, shelf life and application instructions.

B. Comply with manufacturer's storage requirements.

1.08 FIELD CONDITIONS:

A. Weather Conditions
1. Install no materials under adverse weather conditions, or when temperatures are below or above those recommended by the manufacturer.
2. Proceed with work only when forecasted weather conditions are favorable for joint cure and development of high early bond strength.
3. Wherever joint width is affected by ambient temperature variations, install materials only when temperatures are in lower third of manufacturer's recommended installation temperature. Coordinate time schedule with Contractor to avoid delay of project.

B. Protection of adjacent surfaces:
1. Protect by applying masking materials or manipulating application equipment to keep materials in joint. If masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after caulking, before surface skin begins to form.
2. Remove misapplied sealants from surfaces using solvents and methods recommended by manufacturer.
3. Restore surfaces from which sealants have been removed to original condition and appearance.

1.09 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Manufacturer of sealant materials shall provide the services of a factory representative who shall conduct periodic on site checking of caulking work to determine compliance with manufacturer's application directive.

1.10 APPLICATORS

A. Subcontract the caulking and sealing work to a firm experienced in the application of the types of materials required, employing skilled tradesmen for the work and who are approved by the manufacturer of the materials.

1.11 WARRANTY:

A. See Section 01 7839 - Project Record Documents, 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 which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, stain adjacent work, develop voids or do not cure. In addition, provide a letter on the manufacturer’s letterhead at project close-out stating that work has been accomplished in accord with this specification and with manufacturer's application directive.

PART 2 PRODUCTS

2.01 GENERAL:

A. Provide colors as selected by Architect.

B. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.

C. Where exposed to foot traffic, select marketing materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

D. Provide only sealants, joint fillers and other materials materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation conditions, as shown by the manufacture's published data or certification.

2.02 PERFORMANCE REQUIREMENTS:

A. Low-Emitting Materials: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 SEALANTS:

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. General Purpose Exterior Sealant: Polysulfide; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single, or multi- component.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Products:
      a. Sonolastic NP-1 manufactured by Sonneborn Products (BASF Chemical Co.)
      b. Pecora GC9 Synthacalk
      c. Tremco DYmeric
      d. Substitutions: See Section 01 6000 - Product Requirements.
   3. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.

C. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Under thresholds.
   2. Products
      a. BA-98 by Pecora Corporation
      b. Chem-Calk 300 by Bostick
      c. Substitutions: See Section 01 6000 - Product Requirements.

D. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
   1. Color: To be selected by Architect from manufacturer's standard range.
   2. Products:
      a. Sonolac manufactured by (BASF Chemical Co.)

b. AC-20+ Silicone by Pecora Corporation
c. Tremflex 834 by Tremco
d. Substitutions: See Section 01 6000 - Product Requirements.

3. Applications: Use for:
a. Interior wall and ceiling control joints.
b. Joints between interior door and window frames and wall surfaces.

E. Acoustical Sealant: Non-skinning, non-hardening synthetic rubber sealant; single component. Sealant shall increase the STC value of a system through the joint when one or more beads are applied to a joint. Sealant shall inhibit air movement and buffer vibration to reduce sound transmission. Sealant conforms to CAN/CGSB 19.21 M87 (QPL #60963-H).
1. Products:
a. Pecora AC20 FTR Fire and Temperature Rated Acoustical and Insulation Rated Sealant
b. Acoustical Sealant manufactured by Tremco Commercial Sealants and Waterproofing or approved equal.
c. Substitutions: See Section 01 6000 - Product Requirements.
2. Applications: Use for:
a. Expansion joints in floors.
b. Joints between dissimilar materials in sound-rated walls, floors and ceilings including, but not limited to all classrooms and instructional spaces.

F. Self-Leveling Polyurethane Sealant: ASTM C 920, Grade P, Class 25, Uses T, I, M, A, O; multi-component, chemical curing, non staining, non bleeding, self-leveling type.
1. Color: Gray.
2. Movement Capability: Plus and minus 25 percent.
a. Service Temperature Range: -40 to 180 degrees F.
3. Shore A Hardness Range: 20 to 35.
4. Applications: Use for:
a. Horizontal Joints subject to foot traffic.
5. Products:
a. UREXPAN NR-200 by Pecora
b. THC-900 by Tremco
c. TF-100 by BASF
d. Substitutions: See Section 01 6000 - Product Requirements.

G. Silicone Sealant: ASTM C 920, Grade NS, Class 50, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
1. Color: Standard colors matching finished surfaces.
2. Products:
a. Omniseal 50 manufacturered by BASF
b. Pecora 896 as manufactured by Pecora Corporation.
c. Spectrem 3 manufactured by Tremco, Inc.,
d. Substitutions: See Section 01 6000 - Product Requirements.
3. Movement Capability: Plus 50 percent, minus 25 percent.
4. Service Temperature Range: -65 to 180 degrees F.
5. Shore A Hardness Range: 15 to 35.
6. Applications: Use for:
a. Joints in aluminum storefront and curtain wall framing system.

H. Single Component Sanitary Silicone: ASTM C920, Type S, Brade NS, Class 25; Uses NT, A and O. Sincle component, color as seclected meeting VOC requirements of pertinent CARB and/or SCAQMD Rule for sealants VOC (4% by weight VOC or less in smaller than 16 oz package or less than 250 g/L in larger package).
1. Color: To be selected by Architect from manufacturer's standard range.

2. Products:
   a. Pecora 898 - Sanitary Mildew Resistant Silicone Sealant
   b. Tremsil 200 by Tremco Inc.
   c. Substitutions: See Section 01 6000 - Product Requirements.
3. Applications: Use for:
   a. Interior sanitary applications, countertops, backsplashes, lavatories, plumbing fixtures, etc.

2.04 COMPATIBILITY:

A. Before purchase of the specified sealant, investigate its compatibility with the joint surfaces, joint fillers and other materials behind or below the joint in the construction. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation conditions, as shown by the manufacture's published data or certification.

2.05 ACCESSORIES:

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; closed cell polyethylene; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Sealant Backer Rod: Compressible rod stock of closed cell polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam as recommended by sealant mfg. for compatibility with sealant material. Provide size and shape of rod to control joint depth, break bond at bottom of joint, form optimum shape of bead on back size to minimize possibility of extrusion when joint is compressed..

F. Tooling Agent: Agent recommended by sealant manufacturer to insure contact of material with inner joint faces.

G. Divider strips: Synthetic rubber or closed cell synthetic foam not less than 1/6" thick and full depth of sealant; approved by manufacturers of dissimilar materials as being compatible with each other.

PART 3 EXECUTION

3.01 FIELD MOCKUP:

A. Prepare, caulk and finish one sample of each joint condition.

B. Sample joints shall be accepted by Architect prior to beginning work. Retain approved samples as a standard for work.

C. Only neat tooled joints will be accepted.

3.02 EXAMINATION:

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

E. Do not proceed with the work of this section until unsatisfactory conditions have been corrected.

3.02 JOINT SURFACE PREPARATION:

A. Protect by applying masking materials or manipulating application equipment to keep materials in joint. If masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after caulking, before surface skin begins to form.

B. Installer must examine joint surfaces, backing and anchorage of units forming sealant rabbet and conditions under which sealant work is to be performed and notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with sealant work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

C. Clean joint surfaces immediately before caulking joints. Remove dirt, insecure coatings, moisture and other substances which could interfere with bond

D. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's product data indicates that alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution; rinse with clean water and allow to dry before caulking.

E. Roughen joint surfaces on vitreous coated and similar non-porous materials, unless sealant manufacturer's product data indicates equal bond strength as porous surfaces. Rub with fine abrasive cloth or wool to produce dull sheen.

3.03 INSTALLATION:

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
   1. Seal all interior and exterior openings, joints, and flashings and all other places as necessary to provide watertight installation.

D. Remove dirt, unsecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound. Joints should be clean, dry and free from foreign matter.
   1. In masonry joints avoid contamination of water-proofing, form release and curing agents. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's product data indicates that alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution; rinse with clean water and allow to dry before caulking.
   2. On aluminum surfaces, remove protective coating with a Xylol or MEK wipe.

E. Prime or seal joint surface where recommended by sealant manufacturer. Roughen joint surfaces on non-porous materials unless manufacturer's product data indicates equal bond strength as porous surfaces. Rub with fine abrasive cloth or wool to produce dull sheen.

F. Perform installation in accordance with ASTM C 1193.

G. Perform acoustical sealant application work in accordance with ASTM C 919.

H. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

I. Install bond breaker where joint backing is not used.

J. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

K. The sealant shall be applied by gun with nozzle diameter to match the width of the joint so as to fill the opening completely.
   1. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces.
   2. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
   3. Caulking around openings in masonry shall include the entire perimeter of each opening.

L. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

M. Tool joints concave.

N. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealer/caulking compound.

O. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

P. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING:

A. Clean adjacent soiled surfaces.

B. Remove misapplied sealants from surfaces using solvents and methods recommended by manufacturer.

C. Restore surfaces from which sealants have been removed to original condition and appearance.

3.05 PROTECTION:

A. Protect sealants until cured.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

F. Accessories

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Masonry mortar fill of metal frames.

B. Section 07 9005 - Joint Sealing: Caulking between doors and adjacent construction.

C. Section 08 1416 - Flush Wood Doors.

D. Section 08 7100 - Door Hardware.

E. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

F. Section 09 9113 – Exterior Paint.

G. Section 09 9123 – Interior Paint.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2017 .

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; latest edition.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004) or latest edition.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

E. ASTM C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).

F. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2005 or latest edition.

G. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 latest edition.

H. ASTM E 413 - Classification for Rating Sound Insulation; 2004 latest edition.

I. ASTM E 1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

J. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007 or latest edition.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010 or latest edition.

L. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

M. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS:

A. See Section 01 3300 - Submittal Procedures, for submittal procedures.

B. LEED Submittals:
1. Product Data for Credit MR-4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Laboratory Test Reports for Credit IEQ 4: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" or other LEED-approved standard for VOC content.
4. Product Data for Credit EQ-9: For products required to comply with STC ratings for acoustical performance, provide certificates showing testing data for each type acoustical door.

C. 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 grade standard.

D. Shop Drawings: Details of each opening, thicknesses of metal, showing elevations, glazing, frame profiles, conditions at openings and identifying location of different finishes, if any.

E. Schedule: Provide door and frame schedule using the same reference numbers for details and openings as shown on the Contract Documents.

F. Samples: Submit two samples of metal, 2 x 2 inches in size showing factory finishes, colors, and surface texture.

G. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

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

1.05 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Store in accordance with NAAMM HMMA 840.

B. Doors and frames must be properly marked with the door opening mark number to correspond with the schedule.

C. Deliver all steel doors with corrugated edge protection and palletized to provide protection during transit and job storage.

D. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

E. Store hollow metal units on raised platforms in vertical positions with blocking between units to allow air circulation.

F. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal in all respects to new work and are acceptable to the Architect; otherwise, remove and replace damaged items as directed.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Steel Doors and Frames:
   1. Assa Abloy Ceco or Curries: www.assaabloydss.com.
   2. Pioneer Industries: www.pioneerindustries.com.
   3. Windsor Republic Doors: www.republicdoor.com.
   4. Steelcraft: www.steelcraft.com.
   5. Substitutions: See Section 01-6000 - Product Requirements.

2.02 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A569 and ASTM A568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, Type E, matte finish, complying with ASTM A366 and ASTM A568. Provide stretcher-leveled standard of flatness for facing sheets of doors.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, with 1.25 ounce commercial zinc coating mill phosphatized complying with ASTM A525. Provide stretcher-leveled standard of flatness for facing sheets of doors.

D. Supports and Anchors: Provide units fabricated of not less than 16 gauge sheet steel. Galvanize after fabrication where units will be built into exterior walls, complying with ASTM A153, Class B.

E. Inserts, Bolts and Fasteners: Provide manufacturer's standard units, except hot-dip galvanize all items to be built into exterior walls, complying with ASTM A153.

F. Shop-Applied Paint: Provide a rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints, complying with FS TT-P-57 (Type II), TT-P-636, or TT-P-664. Paint galvanized surfaces with a zinc dust-zinc oxide primer complying with FS TT-P-641, Type II.

2.03 DOORS AND FRAMES:

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with SDI 100, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Galvanizing for all units exposed to the exterior and installed in masonry: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
   8. Finish: Factory primed, for field finishing except stainable hollow metal doors shall be factory prefinished.

9. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" or other LEED-approved standard for VOC content.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all 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.

2.04 STEEL DOORS:

B. Interior Doors, Non-Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
2. Core: Steel channel grid.
3. Thickness: 1-3/4 inches.

C. Interior Doors, Fire-Rated:
1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
2. Fire Rating: As indicated on drawings, tested in accordance with UL 10C ("positive pressure").
   a. Provide units listed and labeled by UL.
   b. Attach fire rating label to each fire rated unit.
   c. Provide 3-hour fire-rated doors at all 3-hour rated walls as scheduled.
3. Core: Mineral fiberboard.

2.05 STEEL FRAMES:

A. General:
1. Comply with the requirements of grade specified for corresponding door, except:
   a. Interior non-rated frames: ANSI A250.8 Level 2 Doors: 16 gage frames
   b. Exterior and Interior fire-rated frames: ANSI A250.8 Level 3 Doors: 14 gage frames.
   c. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 2, 16 gage.
   d. Frames for Sound-Rated Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 3, 14 gage, fully welded.
   e. Provide kerfed frames at all interior fire rated and exterior frames.
   f. Grout all frames at masonry, concrete and concrete panel construction. Repair frames as to indicate no evidence of the grout fill access location.
2. Finish: Same as for door.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member where shown to fill opening without cutting masonry units.
5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
6. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.
7. Frames shall be mortised, reinforced, drilled and tapped at the factory for only template mortised hardware. Where surface mounted hardware is to be applied, frames to have reinforcing plates for field installation of hardware.

C. Interior Door Frames in new walls, Non-Fire-Rated: Fully welded type.
2. Provide 3-hour fire-rated door frames at Vault rooms in Administrative Area.

F. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match

door frames, and as indicated on drawings.

2.06 ACCESSORY MATERIALS:

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
   1. Style: Sightproof inverted V blade.

D. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws. Locate on corridor side of opening and on the main room side of non-corridor openings.

E. Astragals for Double Doors: Specified in Section 08 7100.
   1. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.
   2. Astragals for Pairs of wood doors: For fire-rated openings, do not provide a mullion or astragal at the meeting edges of a pair of doors for openings rated up to 90 minutes. See Section 08 1416 - "Flush Wood Doors" for edge treatment of pairs of wood doors.
   3. Acoustical astragals: Provide removable type with integral acoustical seals at paired openings, tested to meet specified STC rating.

F. Plaster Guards: Provide 26 gage steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

G. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

H. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

I. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

J. Wall Anchors: Furnish wall anchors as required to secure frames to adjacent construction, formed of not less than 18 gauge galvanized steel.
   1. Masonry Construction: Adjustable, flat or corrugated or perforated, T-shaped to suit frame size with leg not less than 2" wide by 10" long. Furnish at least three anchors per jamb.
   2. Metal Stud Partitions: Metal Stud type; Provide at least three anchors for each jamb for frames.

K. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 16 gauge galvanized steel sheet.
   1. Monolithic Concrete Slabs: Clip type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.

2.07 FINISH MATERIALS:

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

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 in accordance with the requirements of the specified door grade standard, reviewed shop drawings, manufacturer's recommendations, and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

E. Exposed fasteners on post-installed frames are to be countersunk into the frame and bondo finished over prior to painting. No exposed frame anchors will be accepted. This applies to ALL hollow metal frames whether listed in this section or not.

F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
   1. Acoustical frames:
      a. Solidly grout fill frames eliminating all voids. The flanking path normally found behind the frame must be packed with either 6-12 lb rock wool insulation or grout filled to assure minimum sound transmission.
      b. Seal frames tightly to walls with acoustical sealant both sides of frames.

G. Doors shall be installed plumb and in true alignment in a prepared opening and be fastened to achieve the maximum operational effectiveness and appearance of the unit. Provide clearances as required by door grade standard for non-fire rated doors and as required by NFPA 80 for fire rated doors.

H. Coordinate installation of hardware.

I. Coordinate installation of glazing.

J. Coordinate installation of electrical connections to electrical hardware items.

K. Touch up damaged factory finishes.

L. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

3.04 TOLERANCES:

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING:

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch in accordance with ASTM E 1408; adjust as required to comply.

D. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise damaged.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, hollow steel, and aluminum doors.

E. Lock cylinders for doors for which hardware is specified in other sections.

F. Thresholds.

G. Weatherstripping, seals and door gaskets.

H. Hardware for integral doors of aluminum storefront system and curtain wall systems along with cylinders.

1.02 COORDINATION

A. The General Contractor be responsible for hanging all doors and installation of hardware.

B. Coordinate hardware for related trades such as metal doors, frames, millwork, etc.

C. Coordinate approved shop drawings from any affected trades after receipt of final approved finish hardware schedule.

D. Templates: The hardware supplier shall furnish, promptly, necessary templates and an approved hardware schedule to other trades requiring their use to enable the door manufacturers to make proper provision in their work to receive the architectural finish hardware. Other trades shall furnish to the hardware supplier such drawings and information that might be required in order that proper items of hardware be supplied. Provide only template produced units.

1.03 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Flush Wood Doors.

C. Section 08 3313 - Coiling Counter Doors: Lockable coiling counter doors. Hardware by door manufacturer, except cylinders.

D. Section 08 3326 - Overhead Coiling Grilles: Lockable coiling grilles. Hardware by door manufacturer, except cylinders.

E. Section 08 4110 - Aluminum-Framed Entrances and Storefronts: Heavy Duty Aluminum Wide Stile and Rail Doors. Hardware by door manufacturer if not listed in the Door Hardware Schedule at the end of this section, except cylinders.

F. Section 08 4413 - Glazed Aluminum Curtain Walls: Hardware not listed in the Door Hardware Schedule at the end of this section, except lock cylinders; installation of cylinders

1.04 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2017.

B. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

C. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware. Coordinate schedule with Contractor in order to not delay project.

C. Convey Owner's keying requirements to manufacturers.

D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

E. Sequence installation to ensure efficient progress of the work is achieved in an orderly and expeditious manner. Building shall be lockable as soon as building is dried in.

1.06 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Certificates for Credit MR 5: For product and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Product Data: Submit manufacturers technical product data for each item of hardware, marked to clearly show products to be furnished for this project. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

D. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, See Section 01 6000 - Product Requirements.
   2. Submit manufacturer's parts lists and templates.

E. Schedule: The hardware supplier shall submit to the Architect for approval a complete hardware schedule ten days after the award of the hardware contract. Organize hardware schedule into hardware sets indicating complete designations of every item for each door opening. Include type, style, function, finish, manufacturer, location coordinated with door schedule on drawings, door and frame types and sizes, keying and mounting heights for all hardware.

F. Samples: (If requested by Architect)
   1. Submit 1 sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
   2. Samples will be incorporated into the Work.

G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.

H. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.08 QUALITY ASSURANCE

B. Americans with Disabilities Act (ADA): Provide and install finish hardware in accordance with requirements of Americans with Disabilities Act (ADA).

C. ANSI Standards for Physically Handicapped: Finish hardware shall comply with: "American National Standard for Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People" (ANSI A117.1). latest edition, by American National Standards Institute, Inc.; New York, New York. Before installation of finish hardware, notify Architect of any Contract Documents requirements that are suspected to be in non-compliance with ANSI A117.1-2017.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

E. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience.

F. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.
   1. The AHC shall have a minimum of five years of documented experience with similar type projects.
   2. A representative of the hardware supplier shall visit the job site a minimum of three (3) times during construction, and upon completion of the job shall inspect the hardware and submit a letter to the Architect in duplicate advising that the hardware has been properly installed and is operating properly.
   3. The hardware supplier shall be responsible for supplying the correct hardware to meet all local and state building, fire and accessibility codes.

G. Installer Qualifications:
   1. All hardware shall be installed by tradesmen skilled in the application of commercial grade hardware.
   2. The installer must be approved by the Owner and Architect prior to the start of installation, and provide references of completed school projects. There will be no exceptions.
   3. Installation will be handled through the general contractor, not the hardware supplier.

1.09 SCHEDULING

A. The hardware supplier shall coordinate with the General Contractor to establish dates for processing submittals, furnishing templates, delivering hardware, and installing the work of this section to meet construction progress schedule included in this Project Manual.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually with the required fasteners for proper installation; label and identify each package with door opening code to match hardware schedule.

B. Finish hardware shall be stored in a locked area and remain secured until installation.

1.11 WARRANTY

A. See Section 01 7839 - Project Record Documents, for additional warranty requirements.

B. Installer's Warranty: Installer shall guarantee in writing, that all materials specified in this section shall be free from all defects and shall perform satisfactorily for a period of one (1) year after substantial completion. Installer shall replace, at his own expense, including labor, any items of hardware which may prove defective within this period.

C. Manufacturer's Warranty: Provide manufacturer's warranty against defects in materials and workmanship as follows:
   1. Locksets: 2 years
   2. Door Closers: 10 years

3. Exit Devices: 3 years
4. Other Hardware: 1 year

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
1. Applicable provisions of federal, state, and local codes.
2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities, Latest Edition.
3. Applicable provisions of 2021 International Building Code.
4. Fire-Rated Doors: NFPA 80.
5. Fire-Rated Doors: NFPA 80.
6. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
7. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
8. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

D. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

C. Hardware is to be provided as scheduled at the end of this section and per the following requirements:

1. Locks & Cylinders	Corbin Russwin NO SUBSTITUTIONS
2. Exit Devices	Von Duprin NO SUBSTITUTIONS
3. Closers	LCN NO SUBSTITUTIONS
4. Electronic Hardware & Related Components	Schlage Electronics NO SUBSTITUTIONS
5. Continuous Hinges	Select NO SUBSTITUTIONS

2.02 KEY CONTROLS

A. Facility Manager's Key Cabinet: Sheet steel construction, piano hinged door with key lock.
1. Mounting: Wall-mounted.
2. Capacity: Actual quantity of keys, plus 50 percent additional capacity.
3. Horizontal metal hook strips with replaceable labels covered with clear plastic.
4. Size key hooks to hold 6 keys each.
5. Finish: Baked enamel, color as selected.
6. Key cabinet lock to building keying system.
7. Hardware Contractor shall set up key control system and place keys in cabinet.
8. Locate cabinet in administration vault as coordinated with the architect & owner.

2.03 KEYING

A. Door Locks: Great grand master keyed.
1. Owner shall approve complete keying layout in writing prior to placing lock order with factory.

B. Supply keys in the following quantities:
   1. 10 master keys for each master key group.
   2. 10 grand master keys.
   3. 10 great grand master keys.
   4. 10 construction keys.
   5. 10 control keys and 25 extra cylinder cores.
   6. 3 change keys for each lock.

C. Provide schematic prepared by hardware supplier and instructions as to its use in design of the system.

D. The master keys along with three (3) control keys shall be sent direct to the Owner's Representative by registered mail, return receipt requested.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Set units level, plumb and true to line and location.

C. Set hardware accurately and securely anchor with attachment devices; set screws level, flush and draw up tight.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Do not install surface mounted items until finishes have been completed on the substrate.

F. Use templates provided by hardware item manufacturer.

G. Do not install surface mounted items until finishes applied to substrate are complete.

H. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

I. Set thresholds for exterior doors in full bed of butyl - rubber or polyisobutylene mastic sealant.

J. Mounting heights for hardware from finished floor to center line of hardware item:
   1. For steel doors and frames: See Section 08 1113.
   2. Wood doors: See Section 08 1416.

K. Installer shall:
   1. Advise the hardware supplier before proceeding with door stop installation for possible replacement if door stop scheduled for an opening is not appropriate due to furniture layout or other reasons.
   2. Provide sex nuts and bolts for door closers.
   3. Provide 4-7/8-inch lock strikes unless otherwise noted on schedule.

3.03 FIELD QUALITY CONTROL

A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware

and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and leave clean, free from defects, paint, etc.

B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

C. Final Adjustment: Final adjustment shall be done during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in project. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control device to compensate for final operation of heating and ventilating equipment. Replace any hardware which cannot be adjusted to operate freely and smoothly as intended for the application at no expense to the Owner.

3.05 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

B. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.06 PROTECTION

A. Do not permit adjacent work to damage hardware or finish.

B. Do not remove labels on lock or cylinders. This label has keying information necessary for Owner's use.

END OF SECTION

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. Glass-Mat Faced Backing Board.

G. Gypsum wallboard.

H. Joint treatment and accessories.

I. Water-resistive barrier over exterior wall sheathing.

1.02 RELATED REQUIREMENTS:

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 2100 - Thermal Insulation: Acoustic insulation.

C. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.

D. Section 07 9005 - Joint Sealers:

E. Section 09 5100 - Acoustical Ceilings: Gypsum board soffits at acoustical ceilings.

1.03 REFERENCE STANDARDS:

A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).

C. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

D. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.

E. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.

F. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2008.

G. ASTM C 954 - 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; 2007.

H. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

I. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2009.

J. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

K. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing; 2009.

L. ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets; 2008b.

M. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2009a.

N. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000 (Reapproved 2005).

O. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2005.

P. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

Q. ASTM E 413 - Classification for Rating Sound Insulation; 2004.

R. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.

S. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2008.

T. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS:

A. See Section 01-3300 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 ENVIRONMENTAL REQUIREMENTS:

A. Do not install joint treatment compounds unless installation areas comply with the temperature and ventilation requirements recommended by the drywall manufacturer.

1.06 QUALITY ASSURANCE:

A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

1.07 DELIVERY AND STORAGE OF MATERIALS:

A. Coordinate delivery with construction schedule to minimize storage periods at the project site. Deliver in manufacturer's unopened bundles or packages, fully identified with manufacturer's name, brand, type and grade. Protect from weather, soiling and damage using handling equipment and storage techniques recommended by manufacturer.

B. ALL GYPSUM WALLBOARD AND INSULATION SHALL BE KEPT DRY. ANY WALLBOARD OR INSULATION THAT GETS WET IN STORAGE OR AFTER INSTALLATION SHALL BE REMOVED AND REPLACED. ALL PRODUCTS SHOWING EVIDENCE OF MOLD GROWTH SHALL BE DISCARDED.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS:

A. LEED Requirements: Were all other criteria are met, Contractor shall give preference to products that contribute to LEED objectives such as:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project, such as American Gypsum.

2. Have a longer documented life span under normal use.
3. Result in less construction waste
4. Contain recycled content
5. Contribute to indoor air quality, such as Certainteed AirRenew gypsum board.

B. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 GYPSUM BOARD ASSEMBLIES:

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

B. Provide completed assemblies complying with ASTM C 840 and GA-216.

C. Interior Partitions at all interior metal stud walls: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC of 45-49 or higher when indicated, calculated in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90.

D. Fire Rated Assemblies: Provide completed assemblies in compliance with tested assembly.
1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.

2.03 METAL FRAMING MATERIALS:

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

B. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
2. Studs: "C" shaped with flat or formed webs, 20 gauge.
3. Runners: U shaped, sized to match studs.
4. Ceiling Channels: C shaped, 16 gauge.
5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission. Shape to achieve STC assembly indicated.

C. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.

D. 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.

E. Gypsum Drywall Suspension System: USG Suspension System for flat gypsum panel ceilings. Pre-engineered, ASTM C645, G40 (G90 severe environmental conditions) hot-dipped galvanized system meeting all seismic and sound requirements of this project. Installation must follow IBC and ICC-ESR-1222

2.04 BOARD MATERIALS:

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum: www.americangypsum.com.
2. CertainTeed Corporation: www.certainteed.com.

3. Georgia-Pacific Gypsum LLC: www.gp.com/gypsum.
4. National Gypsum Company: www.nationalgypsum.com.
5. Temple-Inland Inc : www.templeinland.com.
6. USG Corporation: www.usg.com.
7. Substitutions: See Section 01-6000 - Product Requirements.

C. Abuse-Resistant Wallboard: Shall be 5/8" Fiber Rock brand VH1 panels by USG. Comply with ASTM E-119, ASTM E-84 and ASTM D4977.
   1. For all exposed drywall wall surfaces below 8 feet above the finished floor (except for administration areas not exposed to students or public use), provide abusive resistant gypsum wallboard with paper-face surface suitable for receiving decorator finish and with long edges tapered or radial eased to receive manufacturer's standard joint.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
   1. Core: 5/8 inch (15.9 mm), Type X.
   2. Long Edges: Tapered.
   3. Mold Resistance: ASTM D 3273, score of 10.

E. Backing Board for Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including shower ceilings and behind hard tile.

      For all exposed shower drywall ceiling surfaces, provide 1/2" thick panels surface suitable for receiving skim coat of Durabond setting compound. Skim-coat the entire surface to a Level 5 finish. Tape with fiberglass mesh and finish all joints smooth. Finished surface is to receive one coat epoxy primer and two coats of epoxy paint.

   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
   3. Glass-Mat-Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C 1178.
      a. Standard Type: Thickness 1/2 inch.
      b. Products:
         1) Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
         2) Temple-Inland Inc; GreenGlass Tile Backer.
         3) Substitutions: See Section 01-6000 - Product Requirements.

F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Glass-Mat-Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C 1177/C 1177M.
   3. Unfaced Sheathing: Water-resistant exterior fiber-reinforced gypsum sheathing panels as defined in ASTM C 1278/C 1278M, and exceeding the relevant requirements of ASTM C 1177/C 1177M.
   4. Core Type: Regular.
   5. Regular Board Thickness: 5/8 inch.
   6. Edges: Square, for vertical application.
   7. Glass-Mat-Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand.
      b. Georgia-Pacific Gypsum LLC; DensGlass Gold Sheathing.
      c. National Gypsum Company; Gold Bond Brand e2XP Extended Exposure Sheathing.
      d. Temple-Inland Inc; GreenGlass Exterior Sheathing.
      e. Substitutions: See Section 01-6000 - Product Requirements.
   8. Unfaced Products:

a. USG Fiberock Brand Aqua-Tough Sheathing Panels.

2.05 ACCESSORIES:

A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool. See section 07 2100 “Thermal Insulation” for additional acoustical insulation products and information.

C. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Acoustical sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   2. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

D. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

E. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2-inch-wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Ready-mixed vinyl-based joint compound.
   3. Chemical hardening type compound.

F. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

G. Screws for Attachment to Steel Members From 0.033 to 0.112 Inch in Thickness: ASTM C 954; steel drill screws for application of gypsum board to loadbearing steel studs.

H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION:

A. Metal Framing: Install in accordance with ASTM C 754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center unless other noted.

1. Level ceiling system to a tolerance of 1/1200.
2. Laterally brace entire suspension system.

C. Studs: Space studs as indicated.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. 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 mechanically fastened steel channel blocking for support of:
1. Wall mounted cabinets.
2. Plumbing fixtures.
3. Toilet partitions.
4. Toilet accessories.
5. Wall mounted door hardware.
6. Markerboards
7. Other wall-mounted fixtures and equipment

3.04 BOARD INSTALLATION:

A. Comply with ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exterior Sheathing: Comply with ASTM C 1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
1. Tape-seal joints immediately after installation in accordance with manufacturer's recommendations. Use fiberglass joint tape provided by same manufacturer as sheathing.

E. Glass-Mat Faced Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions. Use glass-mat faced backing board as substrate behind ceramic wall tile at metal stud wall conditions unless otherwise noted.

F. Installation on Metal Framing: Use screws for attachment of all gypsum board.

G. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

H. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

3.05 ISOLATION OF DRYWALL FROM OTHER CONSTRUCTION:

A. Provide Perimeter Relief where non-load-bearing drywall partitions abut structural decks or ceilings or vertical structural elements. Allow not less than 1/4", nor more than 1/2" gap between gypsum drywall and structure. Finish edges of drywall face layer with square-nose metal casing bead and caulk space between casing bead and structure with continuous sealant bead. Attach drywall to studs not less than 1/2" below bottom edge of ceiling track flanges and to first stud adjacent to vertical tracks. Do not attach drywall directly to tracks.

B. Where Drywall Partitions Intersect Masonry Walls, provide control joint not less than 1/4", nor

more than 3/8" wide between gypsum wallboard and masonry. Finish the exposed edges of gypsum board with square nose metal casing bead and caulk space between casing bead and masonry with continuous sealant bead. Caulking of the joint will be at the architect's discretion depending on craftsmanship of the condition. It is preferred that the joint not be caulked

3.06 INSTALLATION OF TRIM AND ACCESSORIES:

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.
   3. Where ceilings and soffits are greater than 30' runs and do not exceed 12' in width.
   4. Where ceilings or wall areas exceed 300 sq. ft.
   5. At the strike side of doors extending from the top of door frame to 8" above ceiling.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.07 JOINT TREATMENT:

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C 840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. 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.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

   As a minimum, Level 4 finishing shall be required for this project where GWB is exposed to view. In areas not exposed to view, provide as a minimum Level 2 finishing procedures.

3.08 TOLERANCES:

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Coated glass mat backer board as tile substrate.

E. Ceramic accessories.

F. Waterproofing under tile

G. Ceramic trim.

H. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-In-Place Concrete.

B. Section 07 9005 - Joint Sealers.

C. Section 09 2116 - Gypsum Board Assemblies: Installation of tile backer board.

D. Section 22 4200 - Plumbing Fixtures:

1.03 REFERENCE STANDARDS

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2005.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2005.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (R2005).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (R2005).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (R2005).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (R2005).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (R2005).

K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer

Units; 1999 (R2005).

L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005.

M. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).

N. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999 (R2005).

O. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).

P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2008.

Q. ASTM C 1178/C 1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2008.

R. TCNA (HB) - Handbook for Ceramic Tile Installation; 2010.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Tile: 2 percent percent of each size, color, and surface finish combination.

G. Sustainable Design Submittal:
1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

1.05 QUALITY ASSURANCE

A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.

B. Standards: Mortar and grout materials and installation standards of the American National Standards Institute (ANSI) and Standard Specification for Ceramic Tile TCNA 137.1 - 2008 apply to the work, except as otherwise indicated.

C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

D. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.
1. Installer shall employ skilled mechanics trained and experienced in tile work.
2. Registered as members in good standing with the Tile Council of America or an affiliated

provincial association.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

B. Deliver all products to job site in manufacturer's unopened containers with grade seals unbroken and labels intact.

C. Keep tile cartons dry and clean.

1.07 FIELD CONDITIONS

A. Maintain ambient and substrate temperature of 50 degrees F during installation and curing of mortar materials.

B. Protect Portland cement based materials from direct sunlight, radiant heat, forced hot and cold ventilation and drafts until cured, to prevent premature evaporation of moisture. When installed at low temperatures allow for longer curing time and protect from damage until cured.

C. Do not install epoxy based materials when surface temperature is less than 60 degrees F (16 degrees C) or over 90 degrees F (32 degrees C).

1.08 WARRANTY

A. Provide manufacturer's standard written 10-year warranty, covering materials and labor for replacement of defective materials.

B. Provide Contractor's warranty that work will be free of defects in materials and workmanship for 5 years.

PART 2 PRODUCTS

2.01 GENERAL

A. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.

B. Low-Emitting Materials: Flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" or other LEED-approved standard for VOC content.

C. See drawings for floor tile patterns.

D. Equal products will only be considered if substitutions are submitted and accepted by the architect prior to the bid.

2.02 TILE

A. Manufacturers: All products of each type by the same manufacturer.
1. Tile selection shall be as indicated on drawings.
2. The Architect reserves the right to select tile from any series listed when preparing color schedule. The tile contractor shall supply the selected tile at no additional cost to the Owner.
3. Substitutions: See Section 01 60 00 - Product Requirements.

D. **Quarry Floor Tile used in Dry Storage Room:** ANSI A137.1, and as follows:
1. Classic Quarry Tile, manufactured by DalTile, or approved equivalent product. Quarry tile is to match adjacent tile in Kitchen area.
2. Moisture Absorption: ≤ 3.0 percent, ASTM C373.

3. Coefficient of Friction: Wet: ≥ 0.60
4. Size and Shape: 6 x 6 inches.
5. Edges: Square.
6. Surface Finish: Unglazed
7. Color: To be selected from manufacturer's standard range.
8. Trim Units: Matching cove base, trim and surface bullnose shapes in sizes coordinated with field tile.
    a. Provide bullnose trim edges where required.

Use "SPECTRALOCK® 2000 IG" Epoxy Grout, Color TBD, by Laticrete.
Reference floor pattern layout plans for distribution.

2.03 TRIM AND ACCESSORIES

A. Ceramic Accessories: Same color and finish as adjacent field tile; same manufacturer as tile.

B. Porcelain Trim: Matching bullnose, cove base, cove, and corner trim ceramic shapes in sizes coordinated with field tile.
    1. Applications: Use in the following locations:
        a. Open Edges: Bullnose.
        b. Inside Corners: Jointed.
        c. Floor to Wall Joints: Cove base.
    2. Manufacturer: Same as for tile.

C. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
    1. Applications: Use in the following locations:
        a. Open edges of floor tile.
        b. Transition between floor finishes of different heights.
            1) Tile/Terrazzo Transition: Schulter Systems Reno-U or approved equal.
            2) Tile/Carpet Transition: Schulter Systems Reno-TK or approved equal.
        c. Expansion and control joints, floor and wall.
    2. Manufacturer:
        a. Schluter-Systems: www.schluter.com.
        b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 MORTAR MATERIALS

A. Manufacturers:
    1. Basis of Design: Laticrete International, Inc.: www.laticrete.com.
    2. Bonsal American, Inc: www.sakrete.com
    3. Bostik Inc: www.bostik-us.com.
    4. Custom Building Products: www.custombuildingproducts.com.
    5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mortar Bed Materials: Portland cement, sand, latex additive and water.

C. Mortar Bond Coat Materials:
    1. Latex-Portland Cement type: ANSI A118.4 and A118.11.
        a. Thin-Set: One-step polymer fortified, thin-set mortar. Use at small size tile on flat surfaces. Laticrete 254 Platinum or approved equal.
            1) Shear Bond, Porcelain Tile, 28 day cure - ANSI A118.4-1999; F-5.2.4: 500 psi (3.5 MPa).
            2) Shear Bond, Porcelain Tile, Water Immersion - ANSI A118.4-1999; F-5.2.3 340 psi (2.3 MPa).
            3) Water Absorption - ANSI A118.6-1999; H 4.4 4% max.

4) Compressive Strength - ANSI A118.4-1999; F-6.1: 5000 psi (34.5 MPa)
5) TCNA Service Rating - ASTM C-627: Extra Heavy
6) Tensile Bond - S 5980:1980 Class AA; 14 days: 1575 N (355 lbs)
7) Shear Adhesion - BS 5980:1980 Class AA; 14 days: 22.8 kN (5126 lbs)
8) Coefficient of Linear Thermal Expansion - ASTM C-531: 65x10-7 / Degrees F (117x10-7 / Degrees C)
9) Color: Gray.

b. Medium Set: Polymer fortified dry-set mortar formulated for large-format tile. Mortar may be built up to 3/4". Use at large size tile and where necessary to allow for proper fit to sloped floor drains. Laticrete 220 Marble and Granite Mortar with Laticrete 3701 Mortar Admix.
1) Compressive Strength: 5,000 psi (34.5 MPa), min. in accordance with ANSI A118.4.
2) Hardness: 70 to 80, in accordance with ASTM D 2240 D-scale for 72 hours.
3) Wet Density: 135 pcf (2166 kg/cu m), nominal, in accordance with ASTM C 905.
4) Water Absorption: 5 percent, max. in accordance with ANSI A118.6; 1999 H-4.4.
5) Surface Burning Characteristics: Flame spread and smoke developed indices of 0, in accordance with ASTM E 84, modified.
6) Color: Gray.
7) Color: White.

c. Thick-Bed Mortar: Polymer fortified blend made of factory-blended cement and aggregates and polymers requiring only the addition of water; weather, frost, and shock resistant. Laticrete 3701 Fortified Mortar Bed or approved equal.
1) Compressive Strength: 4,000 - 5,000 psi min., in accordance with ANSI A118.7.
2) Water Absorption: 5 percent, maximum, in accordance with ANSI A118.7.
3) Flexural Strength: 1100 - 1200 psi in accordance with ANSI A118.7.
4) Shrinkage: 0.05% in accordance with ASTM C157.
5) TCNA Service Rating: Extra Heavy.

2.05 GROUT MATERIALS

A. Manufacturers:
1. Basis of Design: Laticrete International, Inc.: www.laticrete.com.
2. Bonsal American, Inc: www.sakrete.com
3. Bostik Inc: www.bostik-us.com.
4. Custom Building Products: www.custombuildingproducts.com.
5. Substitutions: See Section 01-6000 - Product Requirements.

B. Epoxy Grout: ANSI A118.3, modified epoxy emulsion grout, color as selected from manufacturer's standard colors; use for all applications, except at kitchens and areas subject to harsh chemicals. Laticrete SpectraLOCK PRO Grout or approved equal.
1. Water cleanability: Up to 80 minutes.
2. Initial set: 2 hours.
3. Service strength: 24 hours.
4. Shrinkage: 0.25 percent.
5. Quarry/quarry bond strength: 1,000 psi (6.9 MPa) - Failure at tile.
6. Compressive strength 3,500 psi (24 MPa) - 7 days.
7. Tensile strength 1,100 psi (7.6 MPa) - 7 days.
8. Thermal shock 510 psi (3.5 MPa).
9. Water absorption: Less than 0.50 percent.
10. Color: As selected by Architect from manufacturer's full range.

C. Industrial Epoxy Grout: ANSI A118.3, Highly chemical resistant, industrial grade epoxy grout at kitchens and areas subject to harsh chemicals. 100 percent solids stain resistant, acid- and chemical-resistant, water cleanable. Laticrete SpectraLOCK 2000 IG or approved equal.

1. Compressive Strength: 10,000 psi (69 MPa), min., in accordance with ANSI A118.5.
2. Bond Strength: 620 psi (4.3 MPa), min., in accordance with ANSI A118.5.
3. Thermal Shock Resistance: Complies with ANSI A118.3.
4. Shrinkage and Sag Resistance: Complies with ANSI A118.5.
5. Initial Set and Service Set Time: Complies with ANSI A118.5.
6. Service Rating: Passing ASTM C 627 cycles 1-14 (TCNA "Extra Heavy").
7. Color: As selected by Architect from manufacturer's full range.

D. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical missions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.06 ACCESSORY MATERIALS

A. Cleavage Membrane: No. 15 asphalt saturated felt.

B. Waterproofing Membrane at Floors and Showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Material: Single component, self-curing, liquid rubber polymer that forms a flexible, seamless waterproofing membrane that does not require the use of fabric in the field, coves or corners. Membrane shall function as a load-bearing waterproofing membrane and a crack isolation membrane.
      a. TCNA Performance Level: Extra Heavy
      b. Membrane shall contain anti-microbial protection.
      c. 7 day hydrostatic test: Pass in accordance with ANSI A118.10
      d. 7 day tensile strength: 265-300 psi in accordance with ANSI A118.10
      e. 7 day water immersion: 95-120 psi in accordance with ANSI A118.10
      f. 7 day shear bond: 200-275 psi in accordance with ANSI A118.10
      g. 28 day shear strength: 214-343 psi in accordance with ANSI A118.10
      h. System crack resistance: Pass (high) in accordance with ANSI A118.12
   2. Adhesives shall have a VOC content of [65] <Insert value> g/L or less.
   3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

C. Crack Suppression and Anti-Fracture Membrane: Thin, fabric reinforced fluid-applied rubber membrane with capability of bridging non-structural cracks. Laticrete Blue 92 Anti-Fracture Membrane or approved equal.
   1. Service Rating: Passing ASTM C 627 cycles 1-14 (TCNA "Extra Heavy").
   2. System Crack Resistance - ANSI A118.12 5.4: Pass at 1/8 inch (3 mm).
   3. Elongation - ASTM D751- 89 17.1: 20- 30%.
   4. Breaking Strength (Cut Strip Method) ASTM D751:1700- 1900 Psi (11.72- 13.10 MPa).
   5. Nominal Dry Thickness LIL 1013- 92 0.020 inch (0.51mm).
   6. 28 Day Shear Strength - ANSI A118.12 5.1.5: 125- 175 Psi (0.86- 1.6 MPa).
   7. Point Load - ANSI A118.12 5.2: 3200- 3700 lbf (14- 16 kN).
   8. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

D. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

E. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

F. Coated Glass Mat Backer Board: ASTM C 1178/C 1178M, with coated inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.

G. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape.

H. Sealant: Single component neutral cure silicone sealant designed for exterior and interior applications for ceramic tile & stone applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

F. Do not proceed until the unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

E. Install tile backer board in strict accordance with manufacturer's instructions, using galvanized roofing nails or corrosion-resistant bugle head drywall screws. Bed fiberglass self-adhesive tape at all joints and corners with material used to set tiles.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
   1. See drawings for tile patterns.
   2. Align joints when adjoining tiles on floor and base are the same size.
   3. Layout tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting.
   4. Provide uniform 1/8” joint widths for tiles up to 8” x 8” and 1/4” joints at larger tiles, unless otherwise shown.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Provide all transition pieces, trim, corners and ends as required to achieve a neat, finished project.

H. Install non-ceramic trim in accordance with manufacturer's instructions.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET AND MEDIUM-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA Handbook Method F113, dry-set or latex-portland cement bond coat, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with The Tile Council of North America Handbook Method F122, with latex-Portland cement grout.
   2. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with The Tile Council of North America Handbook Method F115.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with The Tile Council of North America Handbook Method F121.
   2. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with The Tile Council of North America Handbook Method F114, with waterproofing membrane.

B. Cleavage Membrane: Lap edges and ends.

C. Waterproofing Membrane: Install as specified in ANSI A108.13.

D. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.

3.06 INSTALLATION - WALL TILE & BASE

A. Over coated glass mat backer board on studs, install in accordance with The Tile Council of North America Handbook Method W245.

B. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

3.07 TILE ACCESSORIES:

A. Apply control joint profiles at control joints in slab where indicated. Control joint locations shall be approved by Architect. Provide anti-fracture membrane at all control joints in new and

existing slabs and where new slabs abut existing slabs. Anti-fracture membrane shall extend 6" to each side of control joint. Prime substrate and install in accordance with manufacturer's recommendations.

3.08 EXPANSION JOINTS:

A. Provide horizontal and vertical expansion joints per TCNA EJ171 as follows:
   1. At the perimeter of all spaces 8'-0" x 8'-0" and larger.
   2. At interior spaces not to exceed 20'-0" x 20'-0" in either direction.
   3. Verify expansion joint locations with the Architect prior to installation.

3.09 CLEANING

A. Clean tile and grout surfaces. Remove all grout haze, observing tile manufacturer's recommendations as to use of acid and chemical cleaners. Rinse tile work thoroughly with clean water before and after using chemical cleaners.

3.10 PROTECTION

A. Protect tile in accordance with TCNA recommendations.

B. Do not permit traffic over finished floor surface for 4 days after installation.

C. Place large, flat boards in walkways and wheelways for 7 days, where use of newly tiled floor is unavoidable.

D. Walls: Protect from impact, vibration and heavy hammering on adjacent and opposite walls for at least 14 days after installation, unless manufacturer's instructions allow a shorter period.

E. Protect from food products and chemicals which can cause staining until acceptance by the Owner.

F. Protect from freezing and total water immersion for at least 21 days after installation.

G. Apply to all clean, completed tile walls and floors a protective coat of neutral cleaner solution, 1 part cleaner to 1 part water. In addition cover all tile floors with heavy-duty, non-staining construction paper, masked in place. Just before final acceptance of tile work, remove paper and rinse protective coat of neutral cleaner from all tile surfaces.

3.11 SCHEDULE - See drawings.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.

C. Samples: For each exposed finish.

D. Product test reports.

E. Research/evaluation reports.

F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory.

B. Fire - Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Acoustical tiles complying with ASTM E 1264 for **Class A** materials, when tested per ASTM E 84.

a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Comply with the following:

1. ASTM E 580/E 580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; latest edition.
2. “Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies. This project is in Seismic Design Category “C”.
3. ASCE 7, “Minimum Design Loads for Buildings and Other Structures;” Section 9, “Earthquake Loads.”

4. ESR reports must indicate a minimum of 4pounds per square foot for maximum weight of the installed ceiling system.

D. Pre-installation Conference: Conduct a conference at the project site. A pre-installation meeting with mandatory attendance by the general contractor, ceiling system installer, all adjacent related building trades and affected installers, Chapter 1 and Chapter 17 third party inspectors, shall be coordinated with the Construction Manager and conducted by the Ceiling System Manufacturer and Architect at least two weeks before commencing work. The manufacturer shall review and/or verify the following per product type indicated:
   1. Product data
   2. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.
   3. Conditions of the installation
   4. Samples of system and tiles
   5. Product test reports
   6. Research/evaluation reports
   7. Other items required for a complete system

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 0.5 percent of quantity installed.

2. Suspension System Components: Quantity of each concealed grid and exposed component equal to .05 percent of quantity installed.

PART 2 – PRODUCTS2.

2.1 ACOUSTICAL TILE CEILINGS, GENERAL

A. Acoustical Tile Standard: Comply with ASTM E 1264.
   1. Recycled Content: Provide acoustical tiles with recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 48 percent by weight.

B. Metal Suspension System Standard: Comply with ASTM C 635.

1. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 3 percent.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **10** times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1.Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Seismic struts and seismic clips.

F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

G. Grid, Molding and all other system components must be from same manufacturer as the ceiling panels to maximize warranty.

2.2 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

ACT-3: Kitchen & Kitchen Related Areas, Food Serving Lines, Group Toilets, Locker rooms, and other areas indicated:

A. Armstrong Georgian #794 Unperforated Ceiling Tile, square edge, 2'x2'x1." Grid shall be Armstrong Prelude Plus XL #8201 HD grid and Wall Molding #7801 7/8" wall molding.

B. USG Vinyl Covered Sheetrock #3260 ceiling tile, 2'x2'x1/2", with Donn DXLA26 HD grid and M7Z 7/8" wall molding with aluminum cap.

NOTE: HEAVY DUTY GRID is required on this project regardless of the Seismic Category Designation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 636, ASTM E580/E 580M and seismic design requirements indicated, per manufacturer's written instructions, along with the ceiling system manufacturer's IBC approved test and evaluation reports.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger

spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

i. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
ii. Do not attach hangers to steel deck tabs or to steel roof deck.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.
5. Wood.
6. Gypsum board.
7. Cotton or canvas insulation covering.

B. Field application of paints, stains, varnishes, and other coatings.

C. Materials for back-priming woodwork.

D. Scope: Finish all interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

1. All new work and existing surfaces where construction operations damage existing finish.
2. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
3. Elevator pit ladders.
4. Interior Ladders & Cages
5. Exposed surfaces of steel lintels and ledge angles.
6. Surfaces inside cabinets specified to be field finished.
7. Prime surfaces to receive wall coverings.
8. Backsides of access panels and removable or hinged covers shall be painted to match exposed surfaces.
9. Mechanical and Electrical:
    a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, and hangers, brackets, collars and supports, unless otherwise indicated. Finish shall match adjacent surface.
    b. In finished areas, paint shop-primed items.
    c. On the roof and outdoors, paint all equipment that is exposed to weather or to view, except that which is factory-finished.
    d. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    e. Paint dampers exposed behind louvers, grilles, to match face panels.
    f. Paint closets, areas behind cases, shelving and equipment.

E. Scope: Do Not Paint or Finish the Following Items:

1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   a. Wood doors are factory pre-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, chrome, copper, bronze, and anodized aluminum and similar finished materials.
7. Factory-finished metal work.
8. Marble, granite, slate, and other natural stones.
9. Floors, unless specifically so indicated.
10. Ceramic and other tiles.
11. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
12. Brick and integrally colored block.
13. Glass.
14. Acoustical materials, unless specifically so indicated.
15. Concealed pipes, ducts, and conduits.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS:
The following categories of work are not included as part of the painter-applied finish work or are included in other sections of the specifications except as otherwise shown on drawings or specified herein.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal items, hollow metal work and shop-fabricated or factory built metal mechanical and electrical equipment or accessories.

2. Pre-Finish Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switches, gear and distribution cabinets. Mechanical equipment that does not have finish paint will be painted under this section.

3. Concealed Surfaces: Unless otherwise indicated, painting is not required on wall or ceiling surfaces in concealed areas and inaccessible areas, such as foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and elevator shafts, as applicable to this project. Paint all piping, equipment and other items in these spaces as required.

4. Finish Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials shall not be painted, except as otherwise specified.

5. Operating Parts and Labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

6. Colors: Paint colors will be as selected by the Architect. Before any painting is done the Architect will furnish the Contractor with the selected color chips and schedule showing where the various colors will be applied. Finish colors shall exactly match the color chips. There will be a minimum of 14 colors used in this project. Color changes will be made at accent walls in rooms, door frames to walls, soffits in ceilings, breaks in walls, flutes in columns, column details at bases, column detail at capitols and at other breaks, changes in planes and elsewhere as deemed necessary by the Architect.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.4 LIST OF PROPOSED MATERIALS

A. List of Proposed Materials: Verify, in writing, that products proposed are from products listed herein. This submittal shall include full identifying product names and catalog numbers. Materials for prime coats, undercoats, finish coats and thinning applied to same surface shall be produced by the same manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

C. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

D. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

    a. Vertical and Horizontal Surfaces: Provide Color Card samples of at least 100 sq. ft. (9 sq. m).

b. Once the color(s) have been selected for the color cards, the contractor shall provide a 2 ft. x 4 ft. mockup for each color at locations directed by the architect.

c. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.6 DELIVERY AND STORAGE

A. Deliver materials to job in original containers with labels intact and seals unbroken.

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.

D. Store materials and painter’s tools in a single room assigned for this use only. Keep storage place clean and neat and damage to it shall be corrected.

E. Keep paint and other volatile material tightly covered at all times when not in actual use.

F. Remove soiled and oily rags and waste from building every night and take every precaution to prevent spontaneous combustion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

B. 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 Coatings: 1 gallon of each color and type; store where directed.
3. Label each container with color and finish color schedule designation in addition to the manufacturer's label.

1.8 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. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Interior Painting: Once painting has commenced, provide constant temperature of 65 degrees F. or above, and prevent wide variations in temperature which might result in condensation on freshly painted surfaces.

G. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

H. Protection of Other Work: Painting Contractor shall furnish drop cloths and lay cloths in areas where painting is being done to protect floors and other adjoining work from damage during painting. Paint droppings shall be removed, and any damaged surfaces shall be restored to a condition satisfactory to the Owner.

1.9 COOPERATION WITH OTHER TRADES: Schedule this work and coordinate it with other trades and do not proceed until other work and/or job conditions are as required to achieve satisfactory results. Examine drawings and specifications for the work of various other trades and become familiar with all their provisions regarding painting. Surfaces that are left unfinished by requirement of other sections shall be painted or finished as part of the work covered by this section.

1.10 INSPECTION OF SURFACES:

A. Examine surfaces to receive paint finishes, in accord with Contract Conditions, for defects which cannot be corrected by procedures specified herein under "Preparation of Surfaces" and which might prevent satisfactory painting results. Do not proceed with work until such defects are corrected. Commencing of work constitutes acceptance of surfaces and thereafter, Contractor shall be responsible for satisfactory results as required herein.

B. Painting of Previously Painted Surfaces: The painter shall determine paint compatibility with specified products and surfaces previously painted. Should paints be non-compatible, notify the architect. Otherwise, lightly sand or treat surfaces as recommended by the manufacturer prior to installation of paint.

PART 2 - PRODUCTS

2.1 Approved Manufacturers:

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Colors: As selected by Architect from manufacturer's full range.

C. Paints: The following manufacturers are acceptable provided that their products are equivalent or better in quality, appearance, sheen, durability and VOC content to specified system.

1. Sherwin-Williams: www.sherwin-williams.com.
2. PPG Architectural Finishes, Inc: www.ppgaf.com.
3. Rose Talbert Paints: www.rosetalbert.com.
4. Duron Paints: www.duron.com.

2.2 PAINTS AND COATINGS - GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals:VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

   a. Acrolein.
   b. Acrylonitrile.
   c. Antimony.
   d. Benzene.
   e. Butyl benzyl phthalate.
   f. Cadmium.

g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Flammability: Comply with applicable code for surface burning characteristics.

E. Colors: As selected by Architect from manufacturer's full range.

1. Selection to be made by Architect after award of contract.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PREPARATION AND APPLICATION CLEANING: The Painting Contractor will not only protect his work at all times, but will also protect all adjacent work and materials by suitable covering or other method during the progress of his work. Upon completion of the work, he is to remove all paint and varnish spots from the premises, all rubbish and accumulated materials and he is to leave the work in a clean, orderly and acceptable conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Mechanical and Electrical Work: Paint only walls and floor in equipment rooms when scheduled, unless noted otherwise. Paint items exposed in equipment room spaces (when indicated) and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Pipe hangers and supports.
c. Tanks that do not have factory-applied final finishes.
d. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
f. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

E. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE-Sherwin-Williams Basis of Design

B. CMU Substrates:

1. Masonry/Concrete (at toilets and locker rooms), Opaque, 2-part water-base Gloss Epoxy, 4 coat:
   a. Prime Coat: 2 coats Loxon Block Surfacer A24W200 - Architect must inspect walls for smoothness after filler and before any epoxy paint is applied.
   b. Finish: 2 coats S-W Pro Industrial Water Based Catalyzed Epoxy; B73-300 Series/B73V300 Hardener

2. High-Performance Industrial Finish Coat Systems (except toilets and locker rooms):
   a. Prime Coat: S-W Loxon Block Surfacer A24W200
   Intermediate: S-W Pro Industrial Acrylic B66-650 Series(S/G) or S-W Pro Industrial Acrylic B66-600 Series(Gloss)
   Finish Coat: S-W Pro Industrial Acrylic B66-650 Series(S/G) or S-W Pro Industrial Acrylic B66-600 Series(Gloss)

C. Steel Substrates:

1. Fast-Drying Water-based Enamel System:

   a. Prime Coat: Pro-Industrial ProCryl Universal Metal Primer B66W310.
   Intermediate Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel B53-1150 Series(S/G) (semi-gloss).
   Topcoat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel B53-1150 Series(S/G) (semi-gloss).

2. Fast-Drying Water-Based Dry-Fall System (shop primed or previously painted substrates – interior metal exposed, except aluminum; Color of mechanical duct work and any other items as indicated on the drawings will contrast with deck color):

   a. Full Prime: S-W Pro Industrial Pro Industrial Pro-Cryl Primer B66W310 or S-W DTM Acrylic Primer/Finish B66W1. Allow 72 hours cure time before top coating.

   b. First Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss B42W83

   c. Finish Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss B42W83

3. High-Performance Industrial Finish Coat Systems / Water-Based Dry-Fall System (underside of roof decking used as ceilings – non-ferrous):
   a. Prime Coat: Not needed. Intermediate and Finish Coat Product Self Priming
   Intermediate: S-W Pro Industrial Waterborne Acrylic Dryfall B42W181(Flat white finish).
   Finish Coat: S-W Pro Industrial Waterborne Acrylic Dryfall B42W181(Flat white finish).

E. Gypsum Board Substrates:

1. Latex System:

Prime Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600
Intermediate Coat: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600 Series
Topcoat: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600 Series

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior and Exterior room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Neon and/or LED Signage

E. Dedication Plaque.

F. Building identification signs.

G. Exterior monument and Wayfinding signs

H. Exterior Building Letters

I. Miscellaneous code required signage

1.02 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2113 - Cash Allowances, for cash allowances affecting this section.

B. Allowance shall include material, submittals/shop drawings, installation, the applicable sales tax thereon, and delivering of all signage to the project site.

C. Sign Schedule: Sign schedule, signage floor plans, and bidding shall be handled by the Architect. A contract will be assigned to the General Contractor. The General Contractor shall not issue a contract on this allowance without prior approval of the Architect.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2017.

B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; latest edition.

1.04 SUBMITTALS

A. See Section 01-3300 - Submittal Procedures, 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. *Contractor shall obtain from the architect well in advance of the submittal process the Signage Floor Plans indicating the permanent Room Identification (Space Name and Space Number) as coordinated with the owner. This plan will be used in lieu of the construction plans for Signage, Fire Alarm Programming and any other use requiring the permanent room names and numbers.*
   2. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   3. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   4. Submit for approval by Owner through Architect prior to fabrication.

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. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples of actual materials to be used in project showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.07 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 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Signage:

1. Interior and Exterior room and door signs.
2. Interior directional and informational signs.
3. Emergency evacuation maps.
4. Neon and/or LED Signage
5. Dedication Plaque.
6. Building identification signs.
7. Exterior monument and Wayfinding signs
8. Exterior Building Letters
9. Miscellaneous code required signage

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:

D. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION

GENERAL SPECIFICATIONS

Project Name: Springfield Middle School

Specifications: Walk-in Cooler/Freezer

Walk-in cooler/freezer. 35F cooler and -10 degree freezer. Overall dimensions to be 29'-6" X 18'-0" X 9'0" high with floor. Both compartments have reinforced sanisteel floor. Unit will also be supplied with the following items:

A. The interior finish and exterior finish is to be 26 ga embossed acrylume

B. Cooler and Freezer floor panels shall be sanisteel floors, non slip, easy to clean over .625" plywood and rated as minimum 1000 lbs per square ft capacity cart floor.

C. Both doors to have heated 14X24 viewport windows and strip curtains

D. Door hinges to be Kason 1346 adjustable hinges

E. The cooler and freezer will be supplied with a 36" X 78" door. The door will be provided with (2) heavy duty cam lift type hinges, and heavy-duty latch handle with cylinder lock and built in deadbolt. A top mounted automatic door closer is required. Door to have a stainless-steel heated threshold plate Door to be heavy duty

F. Door to have .100 aluminum treadplate protector 36 inches high on inside and outside of doors for protection.

G. Freezer shall have minimum of (4) 4 ft LED light fixtures. Cooler to have minimum of (2) 4 ft LED light fixtures

H. Power voltage and amperages to be verified by Dealer and school maintenance. GC/Electrician must provide correct disconnects within 6' and connect to new units. GC/Electrician to also provide power connections to be used for the new lights and heaters. The power requirements of the new systems are to be verified by the dealer, rep and refrigeration contractor to check if any existing power sources and breakers can be re-used or if new breakers have to be installed.) See section 16 and 17 for details.

I. Each compartment to have SmartRite digital door, temperature and light management monitor mounted on the door section. Unit have LED temperature display, high/low temperature alarms.

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1.0 GENERAL

1.1 Walk-in Coolers and Freezers shall be designed with modular panels to facilitate easy assembly and disassembly for relocation and for the expansion of the coolers or freezers at a later date. The prefabricated, sectionally constructed panels shall be metal clad.

2.0 PREFABRICATED PANEL CONSTRUCTION

2.1 The panels shall consist of interior and exterior metal skins precisely formed with steel dies and roll-form equipment and thoroughly checked with gauges for uniformity and accuracy. The Insulation shall be "Foamed-In-Place" rigid urethane and when completely heat-cured, shall bind tenaciously to the metal skins and form a ridged four (4) inch thick insulated panel. Gaskets shall be resistant to damage from oil, grease, water, detergents and sunlight, and must be NSF Approved.

2.2 The “R” factor for 4” panels shall be 32.26, for 5” panels shall be 40.32 and for 6” panels shall be 48.39. Materials with lower factors are not acceptable.

2.3 The panel perimeter to be framed with a tongue and grove high density hard-nosed foam rail with not less than 2 lbs square ft density, thoroughly checked for uniformity and accuracy.

2.4 All panels must be interchangeable for fast and easy installation.

3.0 CAM LOCKS

3.1 Cam-action locking devices shall be accurately and precisely positioned in the panels to assure a positive joint. Where wall panels are joined together there shall be a minimum of three (3) locking devices. These locking devices shall consist of a cam-action rotating locking arm in the tongue edge. This locking arm shall engage a steel rod which is firmly anchored in the groove edge. This action will draw all tongue and groove joints firmly and tightly together. Each section of the locking device shall have sufficient surface to assure permanent and rigid anchoring. The locking device shall be anchored in the high density urethane foam perimeter without need of additional anchorage arrangements. Both the locking arm and the steel rod shall be housed in steel pockets and in the high density perimeter tongue and grove.

3.2 All locking of sections shall be performed from the interior by means of a hex wrench which is furnished by the manufacturer with the cooler or freezer. The wrench holes shall be recessed and covered with a plug button. The plug buttons shall be flush with the metal skin of the panels.

4.0 INSULATION

4.1 Wall and ceiling panel insulation for the Cooler/Freezer shall be 4” thick foamed-in-place urethane foam with a thermal conductivity K factor of 0.124. Panel insulation shall have a 97% closed cell structure, compression strength at yield point of 30 lbs. per square inch. The insulation shall be rated self-extinguishing and fire-retardant as specified under UL Class 1 and Factory Mutual 4880.

4.1 Insulation shall be rigid urethane “Foamed-In-Place”. The thermal conductivity factor (K) shall not exceed 0.124 BTU per hour, per degree Fahrenheit, per inch. Overall coefficient of heat transfer (U-factor) shall not be more than .030 for 4” walls, The R-Factor shall have a value of 32.26 for 4” walls,

4.2 The insulation must retain dimensional stability in an operating temperature range of -40 degrees F. (-40.0C) to 250 degrees F. dry heat (121.2C).

5.0 WALK-IN DOORS

5.1 Manufacturer’s standard door shall be flush mounted. Both door and leaf shall be of similar construction and finish as wall panels. Door shall be 36” in width (clear opening) as standard size.

5.2 All pieces shall be “Foamed-In-Place” around entire door opening to secure hardware and prevent racking and warping. The vinyl perimeter frame shall form a rigid structure that eliminates thermal transfer from the exterior to the interior of the door thus reducing the requirement for additional anti-condensate heaters.

5.3 Each door leaf must also include interior 14 gauge steel tapping plates that are embedded into the core foam of the door at the hinge stress points. These tapping plates are “Foamed-In-Place” behind the outer face of the door skin.. Interior steel plates for securing additional hardware shall

be a minimum of 14 gauge steel. The door gasket shall be mounted into a PVC or FRP extrusion material in the perimeter track. The door gasket has a magnetic core and is NSF listed. Securing hardware into wood blocks will not be accepted.

5.4 The door sections shall have a frame which is made of a extruded aluminum material that provides both strength and durability. This extruded aluminum frame shall have a channel molded into it which will accept the anti-sweat heater and allow easy replacement of the heater. Door sections shall also have 14 ga tapping plates embedded into the core foam of the door jamb.

5.5 Each freezer door shall have a single anti-condensate heater and shall be concealed behind the stainless steel edge of the door jamb on all sides to prevent condensation and frost formation. This heater shall be easily accessible for replacement or service. No heater shall be required around the perimeter of the door leaf. Applications of 35 degrees f. and above shall not require a door heater.

5.6 When a threshold is required it shall be made of 16 gauge stainless steel. A lesser gauge or alternate material is unacceptable. The threshold must be installed by the factory and shall be of universal design which will allow the door section to be moved from one location to another without any preparation by installers.

5.7 Door hinges to be Kason 1346 adjustable type hinges

6.0 DOOR HARDWARE

6.1 The door hinges shall be of cam-lift design and shall be heavy duty chrome plated with steel pins and nylon bushings. Hinges shall also be spring loaded and be mounted to a backing plate that has a floating ¼" thick steel plate to facilitate door adjustments without re-drilling holes.

6.2 The door latch shall be constructed of similar materials and finish as the door hinges. The latch shall be designed to open the door easily. The inside safety release features shall comply with OSHA standards. Unit shall have a built-in dead bolt with the capability of locking with a padlock.

7.0 GASKETS FOR WALK-INS

7.1 A vinyl gasket with a magnetic core using "Christmas Tree Type Construction" shall mate with the top edge and along both sides of the door. The magnetic force of the gasket shall be ample enough to keep the door in a closed position and form a tight seal. The bottom edge of the door shall contain a flexible double wiper gasket of black, FDA approved rubber.

8.0 LIGHTING

Each entrance door shall be provided with mini LED light on the interior of the door section. The light shall have a coated glass shatterproof globe. A neon pilot light and toggle switch shall be flush mounted on the exterior of the door section and shall have a stainless steel cover. The door panel and door leaf shall be U.L. approved in its entirety, including all mounted accessories.

8.2 Additional lighting , Minimum (4) 4 ft LED lights for freezer, (2) for the cooler

9.0 HOUSEKEEPING AND SAFETY PROCEDURE

9.1 Each door panel shall have a metal housekeeping and safety release procedure placard and shall be attached with pop-rivets to the metal skin of the door leaf. This placard must be in a highly visible location.

10.0 INSTALLATION AND MAINTENANCE INSTRUCTIONS

10.1 A complete set of instructions covering both the maintenance and the installation of the cooler shall be provided.

11.0 N.S.F. APPROVAL

11.1 Construction shall be of a design approved by the National Sanitation Foundation and shall carry the N.S.F. Label of Approval mounted on each door section.

12.0 U.L. ELECTRIC APPROVAL

12.1 All door sections shall be wired electrically in such a manner and design so as to be approved by Underwriters Laboratories and each door section shall carry the U.L. Listing Mark.

13.0 U.L. 25 FLAME SPREAD CLASSIFIED**

13.1 Each individual panel shall have a flame spread rating of 25 or less, and have a smoke development of 400 or less. Each section shall have affixed to it a label stating the above ratings. (Class 1 composite panel.) Approval of core rated material only, does not constitute a finished product and therefore does not satisfy the requirements of the various state and local building codes. (4" panels)

**This rating is not intended to reflect hazards presented by this or any other material under actual fire conditions. (Classified Building Materials Index)

14.0 10 YEAR PANEL WARRANTY

14.1 The manufacturer shall warrant that the panel sections shall be free from defects in material and workmanship under normal use and service and shall be obligated to repair or replace F.O.B. factory, any section which proves to be defective for the period of 10 years from the date of installation. This warranty shall not include labor or freight.

14.2 This warranty shall not apply to equipment which in the manufacturer's opinion, has been subjected to misuse, misapplied, or improperly installed.

14.3 Manufacturer warrants the paint or finish, door and hardware and parts to be free from defects in materials or workmanship for one year of installation.

16.0 REFRIGERATION

16.1 Provide RFO400L4SEBNT/RL6E121DDARE system (freezer) 404a refrigerant) This is a 4 hp pre-assembled scroll systems. This system includes the condensing unit, unit cooler, defrost timer, expansion valve, dehydrator, sight glass, pre-wired control panel, liquid line solenoid, high and low pressure control, room thermostat & suction line filter. It will also include the weatherproof housing, head pressure control and crankcase heater. Condensate drains are to be copper tubing and freezer drain will have electric heater wire and insulation to prevent freezing. (drains provided by contracted refg. installer). 208-230/3/60 RLA 11.9, MOPD 30, MCA19 12990 BTUH -10F ambient 95F. Evaporator 208-230/1/60 fan amps 1.5, defrost amps 14.3

Provide RFO150E4SEAALNT/RL6E121DDARE system (freezer) 404a refrigerant) This is a 1.25 hp pre-assembled scroll systems. This system includes the condensing unit, unit cooler, defrost timer, expansion valve, dehydrator, sight glass, pre-wired control panel, liquid line solenoid, high and low pressure control, room thermostat & suction line filter. It will also include the weatherproof housing, head pressure control and crankcase heater. Condensate drains are to be copper tubing and freezer drain will have electric heater wire and insulation to prevent freezing. (drains provided by contracted refg. installer). 208-230/3/60 RLA 9.3 , MOPD

20, MCA 15, 13690 BTUH 35F ambient 95F. Evaporator 208-230/1/60 fan amps 1.5, defrost amps 14.3

Condensing unit is to be set outside kitchen on top of new GC constructed building addition. Proper curbs and roof penetrations to be provided by the GC. Units must be positioned with adequate spacing and air flow per the factory refrigeration data sheet. Voltage and scope of work to be verified by site visit prior to ordering. Refrigeration to be installed by dealer or their designated subcontractor/installer. GC/Electrician to provide correct electrical and disconnects. Dealer or their refrigeration installer to mount lights. GC/Electrician to connect power to the lights and switch. Verify power supply prior to ordering.

16.2 Refrigeration system to carry a 5 year compressor warranty and 1 year parts and 30 labor warranty. Refrigeration installer to warrant their workmanship for 90 days.

17.0 INSTALLATION

New cooler/freezer to be installed in new GC constructed building addition adjacent to the kitchen. Bidder to visit jobsite and verify all utilities and scope of work prior to ordering. Erection of the walk-in structure to be done by KEC or their designated refrigeration sub-contractor. Refrigeration installation to be done by KEC or their refrigeration sub-contractor. The installer to flash, trim and caulk where applicable. Panels will be erected and leveled to manufacturer's specifications to insure correct fit. Refrigeration equipment to be installed and proper vacuum pulled prior to charging to insure moisture removal and absence of leaks. General contractor/electrician shall provide necessary electrical to connection points of the equipment. Bidders refrigeration installer to also mount lights to the structure. All penetrations must be properly sealed and conduit must be sealed internally and externally. GC/electrician shall also connect power to the door panel section to provide the 120 v power to the PRP, lights and frame heaters. GC/electrician to also provide power for the freezers drain line heater.

18.0 MANUFACTURERS

18.1 To insure these specifications are met, only Thermal-Rite or approved equal may be used. Submit requests for alternates two weeks prior to bid opening for approval.

19.0 RATINGS AND INDEPENDENT TESTING

2.3.0 The assembly must adhere to the following code and design requirements:
2.3.1 2009 US Energy Bill H.R. 6 Energy Independence Act.
2.3.2 International Energy Conservation Code 2015 C403.2.15 and C403.2.16
2.3.3 DOE Energy Security and Independence Act of 2007 Section 312
2.3.4 ASHRAE 90.1-2013 Section 6.4.5
2.3.5 Factory Mutual 4880
2.3.6 California Code of Regulations Title 20 Sections 11601 – 1608
2.3.7 NSF / ANSI – Standard 7 and Labeled Accordingly
2.3.8 International Building Codes, 2012 and 2015 - Chapter 26, Plastic, Section 2603

PROJECT MANUAL
VOLUME 2

SPRINGFIELD MIDDLE SCHOOL - COOLER/ FREEZER ENCLOSURE

FORT MILL SCHOOL DISTRICT
FORT MILL, SOUTH CAROLINA

JCS Commission No. 22004

January, 2023

VOLUME 2

END OF SECTION

SECTION 21 0010 - GENERAL PROVISIONS – FIRE PROTECTION

PART 1 - GENERAL

1.1 SCOPE:

A. Bids of work covered by each section of these specifications shall be based on the “Fire Protection Sprinkler System Specification Sheet”. Because of small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Contractor shall carefully investigate structural and finish conditions affecting his work and shall arrange such work accordingly as may be required to meet such conditions. Where locations make it necessary or desirable from Contractor's standpoint to make changes in arrangements or details shown on drawings, he may present suggestions for such changes and obtain Engineer's approval prior to making such changes.

1.2 CODES:

A. All work under this division shall be in strict compliance with the International Building Code – 2021 Edition, the International Fire Code – 2021 Edition, NFPA 13 – 2019 Edition, and all applicable Codes and Regulations of the Authority Having Jurisdiction.

1.3 MATERIAL AND SHOP DRAWINGS:

A. Use only new materials and the standard product of a single manufacturer for each article of its type unless specifically mentioned otherwise. Materials and workmanship in the case of assembled items shall conform to the latest applicable requirements of NFPA, NEC, ASTM, and ANSI.

B. Schedule submittals to expedite work. Unless otherwise indicated in this Section, submittals shall be submitted within 30 days of date of Notice to Proceed. Provide electronic copies of submittals for review and approval. All submittals shall be emailed in a single volume. Partial lists will not be considered and will be returned to the Contractor. Identify Project, Contractor, subcontractor, supplier, manufacturer, pertinent drawing sheet and detail numbers, and associated specification section numbers. Identify variations from requirements of Contract Documents. Any submittal that exceeds 10 MB shall be transferred using Dropbox or other similar file sharing service.

C. Contractor responsibilities:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, quantities, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to preparer for revision rather than submitting to Engineer. Coordinate submittals to avoid conflicts between various items of work. Failure of Contractor to review submittals prior to transmittal to Engineer shall be cause for rejection. Incomplete, improperly packaged, and submittals from sources other than Contractor will not be accepted. Submittals not stamped APPROVED and signed by the Contractor will be returned to the Contractor.

2. Prepare drawings illustrating portion of work for use in fabricating, interfacing with other work, and installing products. All equipment submitted shall be of adequate size and physical arrangement to allow unobstructed access when installed, for routine maintenance and other similar operations. Contract Drawings shall not be reproduced and submitted as shop drawings. Title each drawing with Project name and reference the sheet the drawing corresponds to. Drawings shall be in compliance with the requirements of NFPA 13 - 27.1.3.

3. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances. Submit only data which are pertinent. Mark

each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.

4. Engineer will review and return submittals with comments. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer acceptance. Promptly report any inability to comply with provisions. Revise and resubmit submittals as required within 15 days of return from Engineer. Make re-submittals under procedures specified for initial submittals. Identify all changes made since previous submittal.

D. Engineer Review:

1. Detailed drawings, including proposed head layouts, shall be prepared by the Fire Protection Contractor. These drawings shall be submitted to the Engineer for their approval. Upon approval by the engineer, it shall be the responsibility of this contractor to submit the approved shop drawings to the Office of the State Fire Marshal for their approval. All approvals shall be received prior to starting work. Upon receipt of the approval from the Office of the State Fire Marshal, this contractor shall provide one set of approved shop drawings to the authority having jurisdiction for their records.

E. Items Requiring Submittal are as Follows:

1. All items listed in MANUFACTURERS: Section of 21 0010

1.4 ASBESTOS:

A. At any time, the Contractor encounters asbestos, he shall immediately stop work in the immediate area and suspend any further work until asbestos is removed. Contractor shall, upon discovery of asbestos, notify owner, or owner's representative, who shall be responsible for the removal of the asbestos, all in accordance with NESHAP (National Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. Contractor is responsible for and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

1.5 PERMITS AND FEES:

A. Obtain permits, licenses, pay fees, etc. as required for performance of Contract. Arrange for necessary inspections required by governing authority and deliver certificates of approval to Architects or their representatives. File plans required by governing body.

1.6 DEFINITIONS:

A. In this division of the specifications and accompanying drawings, the following definitions apply:

1. Provide: To purchase, pay for, transport to the job site, unpack, install, and connect complete and ready for operation; to include all permits, inspections, equipment, material, labor, hardware, and operations required for completion and operation.

2. Install (Installed): To furnish and install complete and ready for operation.

1.7 CUTTING AND PATCHING:

A. Cutting of walls, floors, roofs, partitions, and ceiling, required for proper installation of the systems shall be performed under this contract.

B. Cutting shall be done in a neat, workmanlike manner. No joist, beams, girders, columns, or other structural members may be cut without written permission from the Engineer. When possible, holes shall be saw-cut or core drilled neat to minimize patching.

C. Re-routing of existing pipes, insulation, etc. as required for installation of new system is included in this work. All work shall be done in accordance with specifications for new work of the particular type involved.

D. Patching shall be performed to match existing structures, exterior walls and roofs, and shall form watertight installation.

1.8 VERIFICATION OF DIMENSIONS, ETC.:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make for approval before starting the work. Contractor shall install all equipment in a manner to avoid building interference.

1.9 COORDINATION WITH OTHER TRADES:

A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. Before beginning work under each section, inspect installed work of other trades and verify that such work is complete to the point where the installation may properly begin.

1.10 PROTECTION OF ADJACENT WORK:

A. Protect work and adjacent work at all times with suitable covering. All damage to work in place caused by Contractor shall be repaired and restored to original good and acceptable condition using same quality and kinds of materials as required to match and finish with adjacent work.

1.11 EXISTING EQUIPMENT AND MATERIALS:

A. All items of equipment removed under this section of the specifications shall become the property of this Contractor shall be promptly removed from this site.

1.12 FIRESTOPPING:

A. Provide firestopping for all mechanical penetrations through fire resistant walls and shaft enclosures, and floor, ceiling, and roof elements of fire resistant assemblies. Firestopping shall provide rating comparable to rating of structure it protects.

B. Firestopping materials currently classified with UL as "Through Penetration Firestop Systems".

C. Firestopping materials shall have been tested in accordance with UL 1479 "Fire Tests of Through Penetration Firestops".

1.13 CLEAN-UP:

A. At the completion of the contract work, all areas where work has been performed shall be left clean. All trash shall be removed from the site by the Contractor.

1.14 APPROVALS AND SUBSTITUTIONS:

A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, or type of construction which, in the judgment of the Engineer, expressed in writing, is equal to that specified.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified, shall be submitted for approval to the Engineer ten (10) days prior to bid date. Requests shall be accompanied by samples, descriptive literature and engineering information

as necessary to fully identify and evaluate the product. No increase in the contract sum will be considered when requests are not approved.

1.15 AS-BUILT DRAWINGS:

A. The Contractor shall keep a record set of drawings on the job; and as construction progresses shall show the actual installed location of all items, material, and equipment on these job drawings. Indicate approved changes in red ink.

B. At the time of final completion, a corrected set of As-Built drawings shall be delivered to the Engineer. A final set of reproducible drawings with job information that reflects the actual installation shall be prepared by the fire sprinkler contractor and given to the Owner along with a set of approved fire sprinkler shop drawings.

1.16 WARRANTY:

A. The Contractor for each section of the work under this division will furnish to the Owner a written warranty for the installation as installed of all equipment covered under each section of the specifications, to perform in a satisfactory manner with no more than normal service.

B. Each warranty shall extend for a period of one year following substantial completion and acceptance of construction. They shall be endorsed by the Contractor.

1.17 MANUFACTURERS:

A. In order to define requirements for quality and function of manufactured products, and requirements such as size, gauges, grade selection, color selections and like specifications requirements, the specifications as written hereinafter are based upon products of those manufacturers who are named hereinafter under various specifications for materials.

B. In addition to products of manufacturers named hereinafter in the specifications, equivalent products of the following named manufacturers will be acceptable under the base bid:

1. Pipe Hangers:

a) Cooper B-Line, Fee and Mason Manufacturing Company, Anvilstar International, Erico Caddy, Tolco a Division of Nibco

2. Sprinklers:

a) Viking Group, Reliable Automatic Sprinkler Company, Tyco Fire Products

3. Identification Items

a) Seton Name Plate Company, W.H. Brady Company, Handley Industries, Inc.

PART 2 - PRODUCTS

2.1 FIRESTOPPING MATERIALS:

A. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inches of water at the location of the test specimen for the time period equivalent to the fire resistance rating of the construction penetrated. Material shall be capable of curing in the presence of atmospheric moisture to produce durable and flexible seal and will form airtight and watertight bonds with most common building materials in any combination including cement, masonry, steel, and aluminum.

2.2 SLEEVES AND OPENINGS:

A. Provide UL certified fire stop sleeving system for all pipe penetrations through fire rated walls, floors, partitions, ceilings, floor-ceiling assemblies, and roofs as tested under ASTM E814 "Standard Method of Fire Tests of Through Penetration Fire Stops".

2.3 SEISMIC RESTRAINTS:

A. Complete installation of fire protection system shall meet the seismic requirements including longitudinal bracing, sway bracing, and four way bracing as required by NFPA 13 – 2019 Edition.

PART 3 - EXECUTION

3.1 PIPE FITTINGS:

A. General: Provide complete systems of piping and fittings for all services as indicated. All pipe, valves, and fittings shall comply with American National Standards Institute, Inc. Code and/or local codes and ordinances. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all windows, doors, and other openings or obstructions.

B. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs. Test all piping prior to concealing.

3.2 PIPE:

A. All piping material shall be as specified in other sections of this division.

3.3 SLEEVES:

A. Provide all sleeves in floors, beams, wall, roof, etc. as required for installing work of this division unless otherwise specified hereinafter. Sleeves thru fire-rated assemblies shall be firestopped as specified herein and insulation shall not pass thru sleeve unless material complies with firestopping specified.

3.4 PIPE HANGERS, SUPPORTS AND INSERTS:

A. Pipe hangers, supports and inserts shall comply with the requirements of NFPA.

B. Hanger or Support Spacing (unless specified different hereinafter):

C. Hanger or support maximum spacing shall be as required by NFPA.

3.5 CLEANING:

A. All surfaces on metal, pipe, insulation covered surfaces, and other equipment furnished and installed under this division of the specifications shall be thoroughly cleaned of grease, scale, dirt and other foreign material.

3.6 TESTING (PIPING):

A. Upon completion of each system of work under this division, and at a designated time, all piping shall be pressure tested for leaks in the presence of the owner or third party inspecting agency. Owner or testing agency shall be notified five days before testing is to be conducted and all tests shall be conducted in their presence. All equipment required for test shall be furnished by contractor at his expense. All tests shall be performed as specified hereinafter. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will

not be permitted. All equipment not capable of withstanding the test pressure shall be valved off during the test.

B. All sprinkler piping shall be tested hydrostatically at not less than 200 pounds per square inch pressure for two hours and shall meet all requirements of Underwriters. All standpipe piping shall be tested hydrostatically at not less than 300 pounds per square inch pressure for two hours and shall meet all requirements of Underwriters.

3.7 OPERATION AND MAINTENANCE INSTRUCTIONS, AND MAINTENANCE MANUAL:

A. Maintenance Manuals: The contractor shall compile all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered through the general contractor to the engineer for approval prior to final inspection.

B. Instructions shall include:

1. Warranty letter signed by the Fire Protection Contractor.
2. Index for each section with each section properly identified.
3. Complete equipment list with model and serial numbers.
4. Copy of one complete, approved submittal for each equipment section.
5. Description of each system, including manufacturer's literature for all items.
6. Suggested operating and maintenance instructions with frequency of maintenance indicated.
7. Parts list for all items of equipment.

C. Manuals shall be 8-1/2 x 11 inch text pages in digital PDF format. Prepare binder covers with printed subject title of manual, title of project, date, and volume number when multiple binders are required. Provide a table of contents for each volume. Internally subdivide the binder contents with bookmarks providing a link to each section. Provide directory listing as appropriate with names addresses, and telephone numbers of design consultant, Contractor, subcontractors, equipment suppliers, and nearest service representatives.

End of Section 21 0010

SECTION 21 0500 - FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This section of the specifications describes requirements pertaining to Fire Protection. All work shall comply with Section 21 0010 - General Provisions Fire Protection, the International Fire Code – 2021 Edition, the International Building Code – 2021 Edition, the South Carolina Fire Protection Sprinkler Act, and NFPA 13 – 2019 Edition.

1.2 SCOPE

A. This section of these specifications is intended to describe furnishing labor, material, and equipment for the installation of the modifications to the existing wet pipe automatic sprinkler system.

B. In all areas, equipment and piping shall be installed so it will not interfere with the air conditioning, heating, ventilating and electrical systems that must occupy the same general areas.

C. Contractor shall design an automatic wet system for the entire building as indicated on the project documents and “Fire Protection Sprinkler System Specification Sheet”.

1.3 COMPLIANCE WITH CODES

A. The complete installation for the building shall be in accordance with code requirements of Fort Mill Fire Department, the Office of the State Fire Marshal, International Building Code – 2021 Edition, International Fire Code – 2021 Edition, South Carolina Fire Protection Sprinkler Systems Act (Title 40, Chapter 10), and NFPA 13 – 2019 Edition.

1.4 SHOP DRAWINGS

A. Detailed drawings, including proposed head layouts, shall be prepared by the Fire Protection Contractor. These drawings shall be submitted to the Engineer for their approval. Upon approval by the engineer, it shall be the responsibility of this contractor to submit the approved shop drawings to the Office of the State Fire Marshal for their approval. All approvals shall be received prior to starting work.

B. Upon completion of the indicated work, one (1) additional set of approved reproducible drawings showing the entire installation "as built" shall be furnished to the Owner for his files.

C. Upon approval by the Office of the State Fire Marshal, the fire sprinkler contractor, through the engineer of record, shall provide the Office of School Facilities with a copy of the approved above ground shop drawings.

1.5 SEISMIC REQUIREMENTS

A. Complete installation of fire protection system shall meet the seismic and restraint requirements including longitudinal bracing, sway bracing, end of branch line restraints, and four way bracing as required.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Sprinkler heads shall be spray type, having 1/2" discharge orifice, with temperature ratings in accordance with Underwriter's specifications unless otherwise noted. Sprinkler heads shall be horizontal sidewall, upright, semi-recessed pendant, or fully concealed flat plate ceiling recessed, adjustable decorative/glass bulb type as manufactured by the Reliable Automatic Sprinkler Company, or equal as listed in 21 0010. All heads shall have a chrome finish except upright heads in area with no ceiling which shall have a brass finish. Sprinklers shall be of temperature rating as required by the application per NFPA including the use of dry sprinklers in the freezer/cooler area. No oversized escutcheons shall be utilized if the suspended ceiling requires a 1” clearance around the vertical penetrations as required by ASCE7-05. Flexible sprinkler drops with braided hose design shall be used in lieu of any required oversized escutcheons and shall be installed per the manufacturers published instructions. Corrugated, or non-braided, flexible drops will not be allowed.

B. The Contractor shall provide extra sprinkler heads and one (1) sprinkler wrench for each type of sprinkler provided in the upfit in the existing spare sprinkler box.

C. All wet pipe sprinkler piping shall be UL listed metallic pipe and materials in accordance with NFPA 13 – 2019 Edition. All piping 2” and smaller shall be schedule 40 black steel piping with rolled-grooved fittings or threaded or threaded fittings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Equipment, materials, installation, and workmanship shall be in accordance with NFPA 13 – 2019 Edition, and the International Fire Code – 2021 Edition.

3.2 FIELD TESTING AND FLUSHING:

A. Preliminary Tests: Hydrostatically test each system at 200 psig for a period of two hours. Flush piping in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings.

End of Section 21 0500

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data

Project name: Springfield Middle School Cooler & Freezer Enclosure

Location in South Carolina:	Address (street # & name): 1711 Springfield Parkway		State Project: ☐ Yes ■ No
	City: Fort Mill	County: York	State Project #: N/A

Water Supply Information

(Flow test data must be less than 1 year old per §40-10-250(A)(1))

Date test conducted: 02 / 02 / 2023	Static pressure (psi): 58	Residual pressure (psi): 42	Flow (gpm): 1060
Distances of test gauges relative to the base of the riser:	Horizontal (ft): 50'	Vertical (elevation difference in ft): -4'	
Source of water supply:	■ Municipal dead-end ☐ Municipal circulation ☐ existing fire pump ☐ Other:		Pipe Size (in.): 6"
Test data by/from:	Name: Eric Werner	Title: Fire Marshal	
	Organization: Fort Mill Fire Department		Phone: 803-802-9946
Fire pump: ☐ New ☐ Existing ■ No Pump	Rated Pressure (psi): N/A	Churn Pressure (psi): N/A	
	Rated Capacity (gpm): N/A	Pressure @ 150% flow (psi): N/A	
On-site water storage: ☐ Yes ■ No	☐ New ☐ Existing	☐ Tank ☐ Other: N/A	Capacity (gal): N/A

NFPA Hazard Classification

(Attach continuation page when necessary)

Area #	Hazard Class or Code Reference	Description of Hazard Protected (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
1	Ord. Haz. - Group I	Storage areas

Design Parameters

(Attach continuation page when necessary)

Area #	System Type	Density(gpm/ft²)/Area(ft²), or Other (Reference code sections)	Inside Hose (gpm)	Outside Hose (gpm)
1	Wet	0.15/1500	0	250

Seismic Design Data:	S_S=0.258	Site Classification=C	Seismic Design Category=B

Codes and Standards

(Attach continuation page when necessary)

Applicable Codes, Standards, & Editions (i.e. 2018 IBC, 2016 NFPA 13, etc.) **for the Scope of Work on the Fire Sprinkler System**

2021 International Building Code, 2021International Fire Code, NFPA 13 - 2019 Edition

Scope of work (i.e. sprinkler system A.G. from 1'-0" A.F.F., U.G. from tap to 5'-0" outside, etc.) and **notes** (attach continuation page when necessary):

Modifications to existing system to accommodate new cooler/freezer and storage area.

Specifier's Information

Name: Todd F. Swygert, P.E.

Engineering services provided through a firm: ■ Yes ☐ No

Firm name: Swygert & Associates, Ltd.

Address: Post Office Box 11686

City: Columbia

State: South Carolina Zip: 29211

Phone: 803-791-9300 ext 102 Fax: 803-791-0830

E-mail: Todd@swygert-associates.com

Certificate of Authorization

Professional Engineer's Seal

Revision No.: 1

Page 1 of 1

Signature: Todd F. Swygert

Date: 3-14-2023

Form Version: July 1, 2021

SECTION 23 0010 - GENERAL PROVISIONS - HVAC

PART 1 – GENERAL

1.1 SCOPE:

A. Bids of work covered by each section of these specifications shall be based on the layout and equipment as shown and specified with only such approved substitutions as are allowed. Drawings show general arrangement of ductwork and piping. Because of small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Contractor shall carefully investigate structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions. Where locations make it necessary or desirable from Contractor's standpoint to make changes in arrangements or details shown on drawings, he may present suggestions for such changes and obtain Engineer's approval prior to making such changes.

1.2 CODES:

A. All work under this division shall be in strict compliance with "International Codes" and all applicable Codes and Regulations of the Authority Having Jurisdiction.

1.3 MATERIAL AND SHOP DRAWINGS:

A. Use only new materials and the standard product of a single manufacturer for each article of its type unless specifically mentioned otherwise. Materials and workmanship in the case of assembled items shall conform to the latest applicable requirements of NFPA, ASME, NEC, ASTM, AWWA, NEMA, and ANSI.

B. Schedule submittals to expedite work. Unless otherwise indicated in this Section, submittals shall be submitted within 30 days of date of Notice to Proceed. Provide electronic copies of submittals in PDF format for review and approval. All submittals shall be bound in a single volume. Partial lists will not be considered and will be returned to the Contractor. Controls may be submitted separately and shall be submitted no later than 60 days of notice to proceed. Identify Project, Contractor, subcontractor, supplier, manufacturer, pertinent drawing sheet and detail numbers, and associated specification section numbers. A table of contents shall be included in the front of the submittal with tabs indicating each section. Identify variations from requirements of Contract Documents.

C. Contractor responsibilities:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, quantities, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to preparer for revision rather than submitting to Engineer. Coordinate submittals to avoid conflicts between various items of work. Failure of Contractor to review submittals prior to transmittal to Engineer shall be cause for rejection. Incomplete, improperly packaged, and submittals from sources other than Contractor will not be accepted. Submittals not stamped APPROVED and signed by the Contractor will be returned to the Contractor.

2. Where required by specifications or otherwise needed, prepare drawings illustrating portion of work for use in fabricating, interfacing with other work, and installing products. Prepare ¼” per foot scale drawings of all mechanical rooms when substituting items of equipment that are not the basis for design. All equipment submitted shall be of adequate size and physical arrangement to allow unobstructed access when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Contract Drawings shall not be reproduced and submitted as shop drawings. Drawings shall be 8-1/2 by 11 inches minimum and 24 by 36 inches maximum. Title each drawing with Project name and reference the sheet the drawing corresponds to.

3. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances. Submit only data which are pertinent. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.

4. Engineer will review and return submittals with comments. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer acceptance. Promptly report any inability to comply with provisions. Revise and resubmit submittals as required within 15 days of return from Engineer. Make re-submittals under procedures specified for initial submittals. Identify all changes made since previous submittal.

D. Engineer Review:

1. Engineer will review submittals for sole purpose of verifying general conformance with design concept and general compliance with Contract Documents. Approval of submittal by Engineer does not relieve Contractor of responsibility for correcting errors which may exist in submittal or from meeting requirements of Contract Documents. After review, Engineer will return submittals marked as follows to indicate action taken:

2. No Exception: Part of work covered by submittal may proceed provided it complies with requirements of Contract Documents. Final acceptance will depend upon that compliance. The term "approved" shall only indicate that there is no exception taken to the submittal.

3. No Exception As Corrected: Part of work covered by submittal may proceed provided it complies with notations and corrections on submittal and requirements of Contract documents. Final acceptance will depend upon that compliance.

4. Revise And Resubmit: Do not proceed with part of work covered by submittal including purchasing, fabricating, and delivering. Revise or prepare new submittal in accordance with notations and resubmit.

E. Samples:

1. Submit samples to illustrate functional and aesthetic characteristics of products with all integral parts and attachment devices. Include full range of manufacturer's standard finishes, indicating colors, textures, and patterns for A/E selection. Submit the number of samples specified in individual specification sections. One sample will be retained by A/E.

F. Items Requiring Submittal are as Follows:

1. Test and Balance
2. Insulation
3. All items listed in MANUFACTURERS: Section of 23 0010

1.4 ASBESTOS:

A. At any time the Contractor encounters asbestos, he shall immediately stop work in the immediate area and suspend any further work until asbestos is removed. Contractor shall, upon discovery of asbestos, notify owner, or owner's representative, who shall be responsible for the removal of the asbestos, all in accordance with NESHAP (National Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. Contractor is responsible for and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

1.5 LEAD FREE:

A. All solder, flux and pipe used in water system must be lead free. Lead free is defined as less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings.

1.6 AMERICANS WITH DISABILITIES ACT:

A. All items or work under this division of the specifications shall comply with guidelines as set forth in the Americans With Disabilities Act.

1.7 PERMITS AND FEES:

A. Obtain permits, licenses, pay fees, etc. as required for performance of Contract. Arrange for necessary inspections required by governing authority and deliver certificates of approval to Architects or their representatives. File plans required by governing body.

1.8 DEFINITIONS:

A. In this division of the specifications and accompanying drawings, the following definitions apply:

B. Provide: To purchase, pay for, transport to the job site, unpack, install, and connect complete and ready for operation; to include all permits, inspections, equipment, material, labor, hardware, and operations required for completion and operation.

C. Install (Installed): To furnish and install complete and ready for operation.

D. Furnish: To purchase, pay for, and deliver to the job site for installation by others.

E. The Mechanical Contractor is cautioned that "furnish" requires coordination with others. Such coordination costs shall be included as part of Mechanical Contractor's bid.

1.9 CUTTING AND PATCHING:

A. Cutting of walls, floors, roofs, partitions, and ceiling, required for proper installation of the systems shall be performed under this contract.

B. Cutting shall be done in a neat, workmanlike manner. No joist, beams, girders, columns, or other structural members may be cut without written permission from the Engineer. When possible, holes shall be saw-cut or core drilled neat to minimize patching.

1.10 VERIFICATION OF DIMENSIONS, ETC.:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting the work. Contractor shall install all equipment in a manner to avoid building interference.

1.11 COORDINATION WITH OTHER TRADES:

A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. Before beginning work under each section, inspect installed work of other trades and verify that such work is complete to the point where the installation may properly begin.

B. Where equipment supplied by an approved manufacturer is substituted for the specified equipment, the Contractor will be responsible for coordinating any changes required in his work or other trades work, including but not limited to electrical requirements, structural steel requirements and space requirements. Any additional costs required to make changes to other trades work shall be borne by this contractor.

1.12 PROTECTION OF ADJACENT WORK:

A. Protect work and adjacent work at all times with suitable covering. All damage to work in place caused by Contractor shall be repaired and restored to original good and acceptable condition using same quality and kinds of materials as required to match and finish with adjacent work.

1.13 FIRESTOPPING:

A. Provide firestopping for all mechanical penetrations through fire resistant walls and shaft enclosures, and floor, ceiling, and roof elements of fire resistant assemblies. Firestopping shall provide rating comparable to rating of structure it protects.

B. Firestopping materials currently classified with UL as "Through Penetration Firestop Systems".

C. Firestopping materials shall have been tested in accordance with UL 1479 "Fire Tests of Through Penetration Firestops".

1.14 CLEAN-UP:

A. At the completion of the contract work, all areas where work has been performed shall be left clean. All trash shall be removed from the site by the Contractor.

1.15 APPROVALS AND SUBSTITUTIONS:

A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, or type of construction which, in the judgment of the Engineer, expressed in writing, is equal to that specified.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified, shall be submitted for approval to the Engineer ten (10) days prior to bid date. Requests shall be accompanied by samples, descriptive literature and engineering information as necessary to fully identify and evaluate the product. No increase in the contract sum will be considered when requests are not approved.

C. The Contractor shall bear the burden and cost of coordinating with all trades any changes in work required by substitutions, including but not limited to electrical connections, additional components required, service clearance, etc.

1.16 AS-BUILT DRAWINGS:

A. The Contractor shall keep a record set of drawings on the job; and as construction progresses shall show the actual installed location of all items, material, and equipment on these job drawings. Indicate approved changes in red ink.

B. At the time of final completion, a corrected set of As-Built drawings shall be delivered to the Engineer. A final set of reproducible drawings with job information that reflects the actual installation shall be prepared by the Engineer and given to the Owner.

1.17 WARRANTY:

A. The Contractor for each section of the work under this division will furnish to the Owner a written warranty for the installation as installed, including controls and all other equipment covered under each section of the specifications, to perform in a quiet, efficient, and satisfactory manner with no more than normal service.

B. Each warranty shall extend for a period of one year following substantial completion and acceptance of construction. They shall be endorsed by the Contractor. Refrigeration compressors shall have a five (5) year warranty.

1.18 MANUFACTURERS:

A. In order to define requirements for quality and function of manufactured products, and requirements such as size, gauges, grade selection, color selections and like specifications requirements, the specifications as written hereinafter are based upon products of those manufacturers who are named hereinafter under various specifications for materials.

B. In addition to products of manufacturers named hereinafter in the specifications, equivalent products of the following named manufacturers will be acceptable under the base bid:

1. Air Distribution:

a) Metal Industries, Price Company, Titus Manufacturing Company, Nailor Industries, Anemostat Products Division, Krueger, J & J Register Co., Carnes Company, Tuttle and Bailey, AirGuide Manufacturing

2. Insulation:

a) Owens Corning, Johns Manville, CertainTeed Corporation, Knauf Insulation

PART 2 - PRODUCTS

2.1 FIRESTOPPING MATERIALS:

A. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inches of water at the location of the test specimen for the time period equivalent to the fire resistance rating of the construction penetrated. Material shall be capable of curing in the presence of atmospheric moisture to produce durable and flexible seal, and will form airtight and watertight bonds with most common building materials in any combination including cement, masonry, steel, and aluminum.

PART 3 - EXECUTION

3.1 SYSTEM BALANCING:

A. The HVAC Contractor is responsible for the entire Test & Balance process. The contractor shall employ an independent balancing firm specializing in total system air balancing as approved by the engineer and certified by the AABC or NEBB. The balancing firm shall be employed prior to installation of any ductwork. Provide all labor, engineering and test equipment required to test, adjust, and balance all heating, ventilating, air conditioning, and exhaust systems.

B. The Contractor is responsible to have a functioning system prior to Testing and Balancing, to provide a joint and cooperative effort to coordinate the test and balance, and to solve any problems in balancing and controls in order to establish proper system performance before leaving the job. The Contractor is responsible for providing the Test and Balance Agency (TAB) with a complete set of project drawings, specifications, and submittals, and for providing and installing new sheave or sheaves, new belts, as required, if a change in fan speed is necessary which cannot be made by adjusting the sheave originally installed. When requested by the Engineer, the TAB Agency will review plans and specifications of the systems prior to installation and submit a report of any deficiencies, which could preclude proper adjusting, balancing and testing of the system. The TAB agency shall submit copies of deficiency reports along with a preliminary report to the Engineer for review prior to final submittal.

C. Instruments used will be those that meet the instrument requirements for Agency Qualifications of the AABC as published in the NEBB “Procedural Standards for Testing Adjusting and Balancing of Environmental Systems” or the AABC "National Standards for Total System Balance".

D. Fan air volume shall be adjusted to within 5% of design, and diffuser air volumes to within 10% of design.

E. Reporting (Submit five copies of final Test Report)

1. Complete nameplate data and equipment schedule number for all rotating equipment.
2. Design and actual operating data for all rotating equipment including inlet and outlet data, flow rates, amps, voltage and rpm.
3. Design and actual duct and diffuser volumes. Prepare a diagram showing flow measurement points.
4. Record coil air pressure drop, filter pressure drop, external static pressure, and fan static pressure.

END OF SECTION 23 0010

SECTION 23 0500 – HEATING, VENTILATION and AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

A. This Section of the Specifications and related drawings describe requirements pertaining to Air Conditioning, Heating and Ventilation work, including applicable HVAC Insulation in separate Section 23 0700. All work shall comply with Section 23 0010 - General Provisions - HVAC.

B. Construct rectangular ductwork to meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards Metal and Flexible" 2016 Edition. All ductwork must comply with all local, state and federal code requirements.

PART 2 - PRODUCTS

2.1 SUBMITTALS:

A. Ductwork shop drawings must be submitted for approval by Engineer. Any ductwork installed without prior approval by the Engineer shall be replaced at the expense of the contractor.

2.2 QUALITY ASSURANCE:

A. The contractor must comply with this specification in its entirety. At the discretion of the Engineer, sheet metal gauges, and reinforcing may be checked at various times to verify all duct construction is in compliance.

2.3 DUCTS, PLENUM, ETC.:

A. As indicated on drawings, provide a system of metal ducts for supply, return and exhaust air.

B. All sheet metal, ducts, casing, plenums, etc., of sizes indicated, shall be constructed from prime galvanized sheet steel.

2.4 DUCTS THRU WALLS:

A. Provide sheet metal flashing around all duct penetrations.

B. Ducts shall be properly sealed per the fire rating and UL assembly.

2.5 AIR DISTRIBUTION:

A. Devices shall quietly and draftlessly deliver and/or remove air quantities required to attain conditions indicated. Exposed surfaces shall have baked enamel finish of manufacturer's standard colors noted.

B. All air distribution equipment and accessories shall be as scheduled on drawings.

2.6 METAL DUCTWALL:

A. All interior ducts shall be constructed of G-90 or better galvanized steel (ASTM A653) LFQ, chem treat. Exterior ductwork or duct exposed to high humidity conditions shall be constructed of G-90 or better galvanized steel LFQ, chem treat. Galvanized metal ducts shall be a minimum thickness of 24 gauge.

B. Support, access doors not part of ducts, bar or angle reinforcing damper rods and items made of uncoated mild steel shall be painted with two coats of primer or provide galvanized equivalent.

C. Low Pressure Supply, Return, and Exhaust Duct:

1. Ductwork on low pressure supply and return systems and restroom exhaust duct shall be fabricated to meet minimum 2” w.g. pressure class in accordance with SMACNA Duct Construction Standard.

2.7 RECTANGULAR DUCT LONGITUDINAL SEAMS:

A. Pittsburgh lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with mastic sealant. Button punch snap lock is not acceptable.

2.8 ROUND DUCT LONGITUDINAL SEAMS:

A. Spiral seam or snap lock seam shall be used on all longitudinal seams for low pressure round duct.

2.9 DUCT JOINTS:

A. Duct joints to meet criteria as defined in SMACNA's 2016 Manual, HVAC Duct Construction Standards, Metal and Flexible.

B. Ductmate or W.D.C.I. proprietary duct connection systems will be accepted as an alternative to SMACNA duct construction standards. Duct constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements.

C. Ductmate 440 or a Butyl Rubber Gasket which meets Mil-C 18969B, Type II Class B, TT-C-1796A, Type II Class B, and TTS-S-001657 must also pass UL-723. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth associated with dark, damp areas of ductwork. The recommended test procedure for bacterial and fungal growth is found in 21CFR 177, 1210 closures with sealing gaskets for food containers.

2.10 FLEXIBLE DUCT:

A. Flexible duct to meet criteria as defined in SMACNA's 2016 Manual, HVAC Duct Construction Standards, Metal and Flexible, or as defined within. Flexible air ducts and flexible air connectors shall be tested in accordance with UL 181, and listed and labeled as Class 0 or Class 1.

B. Flexible duct shall be constructed with a polyethylene core with foil faced insulation.

C. Flexible duct is not allowed in lengths greater than 5', unless otherwise noted. Bends, turns, or sagging, is not accepted.

D. Flexible duct shall only be used for supply and return duct run out connections at diffusers and grilles. Flexible duct shall not be used for exhaust duct.

2.11 SEALERS:

A. Duct sealer shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall seal out water, air, and moisture. Sealer shall be UL listed and conform to UL181B and marked 181 B-M. Sealer shall be Childers CP-145A, or equal.

2.12 DUCTWORK HANGER/SUPPORT:

A. Hang and support ductwork as defined by SMACNA, Chapter 5 2016 Manual, First Edition, or as defined within. Hanger spacing for sheet metal duct not to exceed 8'. Hanger spacing for flexible duct shall not exceed 5’.

B. Duct supports on the exterior of the building on grade or on the roof shall be steel with a hot dip galvanized coating.

2.13 TURNING VANES:

A. Turning vanes shall be double wall turning vanes fabricated from the same material as the duct. Tab spacing shall be SMACNA Standard. Rail systems with non-standard tab spacings shall not be accepted. All tabs shall be used, do not skip tabs. Mounting rails shall have friction insert tabs which align the vanes automatically. Vanes shall be subjected to tensile loading and be capable of supporting 250 lbs. when fastened per the manufacturer's instructions.

PART 3 - EXECUTION

3.1 DUCTWORK, GENERAL:

A. Drawings show general arrangement of duct. Provide all ductwork required to complete installation and avoid interferences. Installation shall conform with applicable portions of Section 23 0010, General Provisions, HVAC. Fabricate ducts as job progresses, using actual job measurements and referring to architectural, structural, electrical, plumbing and equipment drawings in order to avoid conflicts. Where space limitations preclude use of ducts and fittings as shown, consult Engineer for instructions. All ductwork, offsets, fittings, etc. required to make a complete and efficiently operating installation are included in this contract and shall be fabricated and installed in accordance with SMACNA Standards for the application unless noted otherwise herein.

B. All duct dimensions shown on drawings are "inside clear". The sizes of acoustically lined ducts and dampers in ducts shall be increased accordingly. Ducts shall be smooth on inside.

C. Install double thickness turning vanes in duct fittings having centerline radius less than 1-1/2 times width of duct.

D. Support ducts from building structure with 1 inch wide galvanized steel bands per SMACNA recommendations. Wire hangers and nylon straps will not be acceptable.

E. Do not install runout drops to ceiling diffusers until ceiling grids have been installed. Center ceiling diffusers between grids.

F. Provide a locking quadrant balancing damper at each supply takeoff fitting and each exhaust takeoff fitting, for balancing individual diffusers and grilles.

G. Seal all joints in supply, return and exhaust ducts with Childers CP-145 Veloseal, or McGill Airseal, DuroDyne or equal water based synthetic duct sealant, or equal.

H. Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc. before installing any outlets. After installation of outlets and connections to fans are made, blow out entire system with all control devices wide open.

3.2 SUBMITTALS:

A. Provide submittals as required in Section 23 0010. Submit test and balance report per 23 0010. Submit manufacturer's installation, operation, and maintenance instructions.

END OF SECTION 23 0500

SECTION 23 0700 – HVAC INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. General Requirements: This section shall include all insulation as required for installation on all items as specified hereinafter and/or as indicated. All insulations shall be installed in a workmanlike manner by qualified workers in the employment of an independent insulation contractor. Costs of insulation shall be included as part of work by contractor as applicable to his section of work. No separate bid is to be included for insulation work.

B. Fire hazard classification for all material shall not exceed flame spread of 25 and smoke development of 50 as classified by Underwriters Laboratories under Test Method ASTM E-84 and acceptable under NFPA Standards. This is to apply to the complete system and be a composite rating of insulation material with jacket or facings, vapor barrier, joint sealing tapes, mastic and fittings.

C. Prior to commencing any work, submit data sheets for engineer's approval of all material proposed to be used on this project.

PART 2 - PRODUCTS

2.1 DUCTWORK INSULATION:

A. Supply, Return, and Fresh Air Return Ducts in Unconditioned Plenums:

1. Insulate all metal ducts with 2" thick, 3/4 pound density duct wrap with FRK vapor barrier equal to Owens Corning Fiberglas All Service Duct Wrap.

PART 3 - EXECUTION

3.1 DUCTWORK INSULATION:

A. Flexible Insulation (External):

1. Application: Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped to the bottom of the rectangular duct. On ductwork over 24 inches wide, secure insulation with suitable resistance welded mechanical fasteners at not more than 18 inches on center. The 2-inch flange on the facing shall be stapled with 9/16 inch flare door stainless steel staples on 6 inch centers. Apply a three inch wide bank of Childers CP-30 LO or CP-35 or equal Vapor Barrier Coating on all joints of insulation. While tack coat is still wet, embed 3-inch wide White 10 x 10 Fiberglass reinforcing mesh and recoat fully covering the mesh. Spot all pin penetrations or punctures in the insulation with a full coat of CP-30 LO or CP-35 or equal.

END OF SECTION 23 0700

PART 1 - GENERAL REQUIREMENTS

1-01 SCOPE OF WORK

WORK INCLUDED: Furnish all necessary labor, material, plant and equipment, including materials and equipment not specifically mentioned but necessary to complete the work in a neat, correct, and workmanlike manner, to include:

1) Complete branch circuit wiring system for lighting, receptacles, equipment, and outlets.
2) Lighting fixtures, wall switches, receptacles and outlets.
3) Line voltage connections to equipment furnished under other Sections of these specifications, including disconnects, where indicated.
4) Hangers and Supports for Electrical Systems, see Section 260529.

SPECIAL NOTE: The provisions of the Instructions to Bidders, General Conditions, Supplementary General Conditions and all applicable requirements of Division 1 shall govern the work under this Division the same as if incorporated herein.

1-02 EQUIPMENT WIRING

Furnish and install power circuits to and line voltage connections to all equipment furnished and installed by other trades, including disconnects, where indicated. Disconnect switches to be furnished, installed, and wired under Division 26 unless noted otherwise in the Design Documents.

Furnish and install receptacles for equipment furnished with cord and plug, such as electric water coolers, kitchen equipment with cord and plug, computer and data processing equipment, portable welders, shop equipment, and other equipment indicated on the drawings.

CONTROL WIRING: Raceways, wiring, and control devices (thermostats, pressure switches, program clocks, etc) for low voltage HVAC control systems and other mechanical and plumbing systems shall be furnished and installed under Division 23, unless otherwise indicated on the drawings or specified in this Division.

VOLTAGE: The Electrical Contractor shall supply power to equipment at the voltage indicated on the electrical drawings. The Electrical Contractor and the other applicable trades will be held responsible for coordinating the equipment voltages, the control equipment wiring, and the location and type of disconnect required to comply with the equipment manufacturer's requirements, the National Electric Code, and applicable local building codes. IF EQUIPMENT IS SUPPLIED AT A VOLTAGE OTHER THAN THAT PROVIDED, THE GENERAL CONTRACTOR AND SUBCONTRACTORS WILL BE HELD RESPONSIBLE FOR MAKING ANY NECESSARY ADJUSTMENTS TO CORRECT THE CONFLICT, AT NO COST TO THE OWNER, TO THE SATISFACTION OF THE ELECTRICAL ENGINEER.

1-03 EXISTING CONDITIONS

The Contractor will be held responsible for having visited the site and having familiarized himself with the existing conditions prior to submitting his bid.

1-04 COORDINATION

OTHER TRADES: All work under this Section shall be coordinated with other trades to ensure proper location of outlets and equipment connections, and to minimize conflicts with structural members, duct work, piping, etc. Conflicts between equipment and/or material locations shall be corrected as directed by the Architect-Engineer at no additional cost to the Owner.

UTILITIES: The service locations, arrangement and metering for electrical and telephone service entrances shall be coordinated in detail with those utilities. All provisions necessary for these services shall be provided in the Electrical Contractor's bid, unless otherwise indicated.

1-05 CODES AND PERMITS

Installation and materials shall be in accordance with the applicable versions of the National Electrical Code, the International Building Code, and all local codes. Apply and pay for all permits and fees required for this construction.

1-06 DRAWINGS

The drawings and specifications shall be considered as complementary, one to the other, so that materials and labor indicated, called for, or implied by either shall be furnished and installed as if required by both. Where a disagreement exists between the plans and specifications, the item or arrangements of better quality, greater quantity, or higher cost shall be included in the base bid. Any discrepancies between the drawings, specifications, and field conditions shall be resolved with the Engineer prior to commencing work. All agreements shall be verified in writing.

RECORD DRAWINGS: The Contractor shall maintain one set of clean blueprints for "RECORD" drawings. All changes, revisions, or modifications to the project shall be recorded daily on these drawings with **redline pencil**. Upon completion of the project, these redline drawings shall be scanned to PDF electronic files and turned over to the Architect/Engineer for review. Submit PDF electronic files of scanned Record Prints and one set of file prints. All changes, revisions, or modifications on the redline drawings provided to the Engineer shall be noted in red or shall be highlighted in yellow. **Failure to comply with the above criteria may result in rejection of the Record Drawings by the Architect-Engineer.**

1-07 MAINTENANCE AND OPERATING MANUALS

The Contractor shall furnish the Owner two (2) complete maintenance and operating manuals for each piece of equipment and material furnished under this project. These manuals shall be bound in hard cover binders with tabs for each section item or piece of equipment. The manuals shall be furnished to the Engineer prior to the final observation, and final acceptance shall not be given until the Owner's maintenance personnel are instructed in maintenance and operation of all systems.

1-08 GUARANTEE

All materials and labor furnished under this Section of the specifications shall be guaranteed by the Contractor to be free from defects for a period of one year from the date of acceptance. The Contractor shall repair or replace any deficiencies reported in the guarantee period promptly after notification, without any additional compensation from the Owner. LED lamps are included in this warranty. Incandescent, fluorescent, & HID lamps are excluded from this warranty, except that all lamps shall be operational on the date of acceptance.

1-09 MATERIALS

UL LISTING: All materials shall be listed by Underwriter's Laboratories, or an approved equal testing laboratory, and shall bear the "UL" Label, where applicable.

SUBSTITUTIONS: Specific reference in the specifications to any article, device, product, material, fixture, form or type of construction, etc., by name, make or catalog number, with or without the words "or equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition and the Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction, which in the judgment of the

Architect-Engineer, expressed in writing prior to bidding as specified below, is equal to that herein named.

Requests to substitute materials or equipment considered by the Contractor as equal to those specified shall be submitted for review to the Architect-Engineer ten (10) days before bids are taken. Requests shall be accompanied by samples, descriptive literature, and engineering information, as necessary to fully identify and appraise the product. No increase in the contract sum will be considered when requests are not accepted. If the item is found to be equal, the Architect-Engineer will issue an Addendum making it a part of the Contract Documents prior to bidding.

1-10 SUBMITTALS

Electrical shop drawings shall be submitted in one complete package containing all items required by this specification and all other Division 26-28 specifications. Partial shop drawing submittals may be rejected by the Architect-Engineer.

Refer to Section 260510 - Electrical Submittals for additional information.

PART 2 - MATERIALS

2-01 GENERAL REQUIREMENTS

COORDINATION: Coordinate arrangement, mounting, and support of electrical equipment to allow maximum possible headroom (unless specific mounting heights that reduce headroom are indicated), to provide for ease of disconnecting the equipment with minimum interference to other installations, to allow right of way for piping and conduit installed at required slope, and so connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

2-02 GROUNDING

INSULATED CONDUCTORS: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

BARE COPPER CONDUCTORS:

1) Solid Conductors: ASTM B3.
2) Stranded Conductors: ASTM B8.
3) Tinned Conductors: ASTM B33.
4) Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5) Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6) Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7) Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2-03 RACEWAYS AND FITTINGS

GALVANIZED RIGID CONDUIT (GRC): UL 6 and ANSI C80.1 with full weight screwed fittings. Bushings shall be malleable iron. Bushings 1 1/4" and larger shall have insulated throat and grounding lug.

INTERMEDIATE GRADE METALLIC CONDUIT (IMC): UL 1242 and ANSI C80.6, galvanized, with full weight screwed fittings. Bushings shall be as specified above.

ELECTRICAL METALLIC TUBING (EMT): UL 797 and ANSI C80.3 with steel compression or set-screw type fittings. Die-cast fittings are not acceptable. Fittings 1 1/4" and larger shall have nylon insulated throat. Indented or drive-on fittings are not acceptable. Conduit used for Fire Alarm System wiring shall be red, similar to Allied Fire Alarm EMT.

FLEXIBLE STEEL CONDUIT (GREENFIELD): UL 1. Fittings shall be steel.

LIQUIDTIGHT FLEXIBLE STEEL CONDUIT (SEALTITE): UL 360. Fittings shall be steel compression type.

PLASTIC CONDUIT (PVC): Schedule 40 polyvinylchloride. NEMA Standard TC-2 and TC-3 and UL Standards. Conduit, solvent, and fittings shall all be supplied by the same manufacturer. PVC is not permitted above grade.

SURFACE METAL RACEWAY (INDOOR): Wiremold V700 ivory surface metal raceway, or acceptable equivalent. Straps, boxes, elbows, etc. shall all be supplied by the same manufacturer. Total cross-sectional area shall be a minimum of 0.25 square inches.

2-04 WIRE AND CABLE

UL STANDARDS: UL 44 and UL 83.

CONDUCTOR: Copper, soft drawn, per ASTM B3 and comply with NEMA WC 70. Sizes No. 12 and 10 shall be solid conductor. Sizes No. 8 and larger shall have Class B concentric stranding per ASTM B8. Stranded conductors may not be used on No. 12 and No. 10 circuits.

INSULATION: 600 Volt, 90ºC rated, comply with NEMA WC 70. Type THHN-THWN-MTW, unless noted otherwise.

SPLICING MATERIALS:

No. 10 and smaller:	Acceptable wire nuts or insulated crimped splice caps.
No. 8 and larger:	Bronze or copper split bolts, or tinned compression connectors. (Polaris insulated splice blocks may not be used on this project).

Insulation shall be Scotch No. 23 rubber tape and Scotch No. 33 plastic tape, or approved equivalent method.

Power feeders shall not be spliced.

TYPE MC CABLE: Metal-clad cable, Type MC, rated 600 V or less, UL 1569, RoHS compliant, as manufactured by AFC, Encore Wire, or acceptable equivalent. Type MC Cable may not be used underground or under slab on this project.

2-05 BOXES AND WIREWAYS

OUTLET BOXES: Galvanized sheet steel per UL 514. "Through-wall" boxes SHALL NOT BE USED. Back-to-back mounting of boxes is not permitted. All outlet boxes 4"x4" or smaller located on opposite sides of a rated wall shall have a minimum of 24" horizontal spacing or shall be protected with listed putty pads. All outlet boxes larger than 4"x4" (communications outlets, etc.) located in rated walls shall be protected with listed putty pads.

Box sizes shall be as follows:

1) Wall Receptacle Outlets: 4" square by 2 1/8" deep with plaster ring as required.
2) Wall Computer, Communications, Fire Alarm, and TV Outlets (up to 1” conduit): 4" square by 2 1/8" deep with one gang plaster ring. Provide box with 1” conduit knockouts where required.
3) Wall Computer, Communications and TV Outlets (1 ¼” conduit): 4 11/16" square by 2 1/8" deep with one gang plaster ring. Provide box with 1 ¼” conduit knockouts.
4) Ceiling outlets: 4" square or octagonal by 1 1/2" or 2 1/8" deep with stud or ears where required for fixture support.
5) Indoor Surface Mounted Outlets: Wiremold V5744S-2 surface metal box unless noted otherwise on the drawings (steel boxes and EMT conduit may be used in equipment rooms, janitor’s closets, storage rooms).
6) Exposed Outlets: Malleable iron or heavy duty cast aluminum with threaded hubs, Type FS, FD, or GS. Manufactured by Crouse Hinds, Appleton, Killark, or approved equal. Die cast boxes are not acceptable.

SUPPORT FOR RECESSED BOXES IN MASONRY WALLS: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

SUPPORT FOR RECESSED BOXES IN STUD WALLS: Support boxes from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose. Box brackets reliant on support legs pressed against back of opposing wall are not acceptable.

WIREWAYS, PULL BOXES AND JUNCTION BOXES: UL 50. NEMA 250, Type 12 unless otherwise indicated. Code gage galvanized sheet steel, aluminum, or steel primed and painted after fabrication. Manufactured by Square D, Austin Berryhill, Hoffman Engineering, B-Line Systems, or approved equal. Wireways shall have hinged covers.

2-06 WIRING DEVICES

MANUFACTURERS: All wiring devices shall be Hubbell Extra Heavy-Duty Specification Grade Series or equivalent of Arrow Hart Premium Industrial Spec Grade, Pass & Seymour Industrial Extra Heavy-Duty Spec Grade, or Leviton Industrial Spec Grade, unless specifically noted otherwise. If devices not meeting the specifications are supplied, they shall be removed, discarded, and new devices meeting the specification shall be furnished & installed by the Electrical Contractor at no cost to the Owner or the Engineer.

RECEPTACLES: 20A, 125V, 3 wire grounding, NEMA 5-20R, side and back wired, with impact resistant nylon face, Tamper Resistant (NEC 406.12), and standard color as selected by Architect. Duplex receptacles shall be listed Tamper-Resistant receptacles unless noted otherwise.

- "CR" denotes indoor Corrosion Resistant receptacle. Indoor Corrosion Resistant receptacles shall be listed Weather/Corrosion Resistant receptacles per NEC Article 406.8.
- "WP" denotes weatherproof receptacle. Weatherproof receptacles shall be listed Weather/Corrosion Resistant receptacles per NEC Article 406.8 and shall include an Extra-Duty rated “In-Use” style wet location cover with shallow lockable cover.

1) Duplex Receptacle, Tamper Resistant (NEC 406.12): Hubbell HBL-5362-TR, P&S TR63.
2) Single Receptacle, Non-Tamper Resistant: Hubbell HBL-5361 or P&S 5361A.
3) Duplex Receptacle, Corrosion Resistant (NEC 406.8): Hubbell HBL-5362-WR, P&S CR6300.

GFCI RECEPTACLES: Feed Thru type, 20A, 125V, NEMA 5-20R, standard color as selected by Architect. All GFCI Receptacles shall be self-testing and shall be listed Tamper Resistant (NEC 406.12) and Weather Resistant (NEC 406.8).

1) GFCI Duplex Receptacle, Tamper-Resistant and Weather-Resistant: Hubbell GF-5362-SG, P&S 2097HGTRWR

2) Faceless GFCI: Hubbell GFSTBF20, P&S 2087

SWITCHES: 20A, 120/277V, side and back wired. Single pole, double pole, three way, or four way, as indicated on the drawings. Standard color as selected by Architect.

1) Single Pole Switch: Hubbell HBL-1221-X, P&S PS20AC1-X

SPECIAL RECEPTACLES: Specification grade, rating as specified on the drawings.

COVER PLATES: Provide plates to suit the devices.

1) Finished interior walls: Jumbo Stainless Steel.
   - Receptacles noted on drawings as dedicated for computers shall include a factory engraved jumbo stainless steel coverplate labeled “COMPUTER”. See Electrical Symbols and Power Plans on drawings to identify dedicated computer receptacle.
2) Exposed outlets: Galvanized steel.
3) Wet and damp locations: Weatherproof Extra-Duty rated “In Use” type with shallow (3” max) lockable clear cover, Legrand WIUCED10SC/WIUCED20CL, Eaton WIU1T1/WIU2DT1, Taymac MM42OC/MM242OC, or equivalent. Provide plate kits to suite devices.

2-07 LIGHTING AND LIGHTING CONTROLS

INTERIOR LIGHTING

1) FIXTURE SCHEDULE: See Drawings.
2) PRE-PAINTED STEEL: Fixture bodies manufactured from pre-painted steel shall be painted after fabrication, unless noted otherwise on the drawings.
3) LED LAMPS AND DRIVERS: Refer to Lighting Fixture Schedule and Lighting Fixture Schedule Notes on Drawings.
4) LENSES: Virgin acrylic plastic. Nominal thickness of fluorescent fixture lenses shall be 0.125" unless noted otherwise.

LIGHTING CONTROLS

1) LINE VOLTAGE PHOTOCELLS: Rated 1800 volt-amps 120V, 208V-277V, or 480V as noted on the drawings, adjustable slide gate, Precision Type "T", or equal of Intermatic, Paragon, or Tork.

2-08 SWITCHGEAR

SAFETY SWITCHES AND FUSES

1) SWITCHES: NEMA Standard HD, heavy-duty type, 3 pole, 480 or 240 volt, as indicated, with Class R fuse clips. Manufactured by Square D, General Electric, Siemens, or Eaton.
2) FUSES: Time delay type, UL Class RK5. Bussman Fusetrons, or approved equal of Chase-Shawmut or General Electric.
3) NAMEPLATE: Provide engraved nameplate for each safety switch identifying load served, voltage, and fed-from identification.

PANELBOARDS (CIRCUIT BREAKERS)

1) STANDARDS: UL 67 and NEMA PB-1.
2) MANUFACTURERS: Match existing.
3) ENCLOSURE: Existing.

a. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover. Provide typewritten circuit directory for each panel identifying load served and room location. Identify spares in pencil.

4) CIRCUIT BREAKERS: Molded case bolt in type. Breakers shall be rated for the specified panelboard interrupting capacity rating in RMS symmetrical amperes. Two and three pole breakers shall have common internal trip.
5) CIRCUIT NUMBERING: Circuit numbering and breaker layout to match Contract Documents. Where circuit numbering is not permanently engraved, the manufacturer's plastic numbering strips shall be used. Paper numbers are not acceptable and may not be used.
6) NAMEPLATE: Provide engraved nameplate for each panel identifying panel name, voltage, phase, and fed-from identification.

NAMEPLATES AND WARNING SIGNS

1) NAMEPLATE: Provide engraved 3-ply laminated plastic nameplates for each panelboard, safety switch, transformer, enclosed circuit breaker, contactor, and lighting control panel. Attach to equipment cover using metal screws, rivets, or industrial epoxy cement. Manufacturer's sticky-back adhesive is not acceptable. Use 1/4" white letters on black field for normal power items. Use 1/4" white letters on red field for emergency power items (generator).
2) METAL-BACKED, BUTYRATE WARNING SIGNS: Weather-resistant, nonfading, preprinted, celluloseacetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
3) FIRE WALL PENETRATION IDENTIFICATION: See 3-01.

PART 3 - EXECUTION

3-01 GENERAL REQUIREMENTS

WORKMANSHIP: All work shall be installed in a neat and orderly manner. Devices, cabinets, covers, fixtures, exposed raceways, etc., shall be aligned parallel or perpendicular to the building walls, ceiling, and floor. Wiring in panelboards and cabinets shall be neatly looped and laced, and not wadded. The Owner reserves the right to require repair or replacement of defective workmanship and material without additional compensation to the Contractor.

SUPPORTS: Conduits, boxes, cabinets, enclosures, lighting fixtures, etc., shall be securely supported by structural members or structural walls at intervals required by the NEC or as recommended by the manufacturer. Plaster, gypsum board, acoustical tile, and other ceiling and wall finish materials shall not be used for support.

Recessed light fixtures and recessed ceiling speakers shall be independently supported by two (2) or four (4) #12 steel hanger wires. Hanger wires shall be hung within 10 degrees of plumb, and shall be securely tied to structural members such as steel joists or beams, or to steel angles or tubing which bridge structural members. In addition to hanger wires, recessed light fixtures shall be securely fastened to the ceiling framing member per the requirements of NEC 410.36(B). All wiring located above fire rated assemblies must comply with the requirements of NEC 300.11(A)(1).

CUTTING, PATCHING, AND PAINTING: The Electrical Contractor shall perform all boring, drilling, and cutting of walls, ceilings, and floors as required to install and support his raceways and equipment. Provide rough patching to seal penetrations through walls, ceilings, and floors. Finish patching and painting will be performed by the General Contractor.

FIRE WALL PENETRATIONS: Penetrations through fire rated walls and floors shall be sealed to maintain the integrity of the fire rating. Raceways through penetrations shall be in metal raceways. Penetration openings shall be sealed after the installation of the raceway with UL listed fire retardant material in accordance with Section 078413 (where applicable). Through penetrations of conduits and cables of fire resistance rated walls must comply with Section 714.3.1 of the IBC. Through penetrations of fire resistance ceiling assemblies must comply with section 714.4.1.1 of the IBC. Firestopping for this project to be performed by a single firestopping subcontractor, refer to Section 078413 – PENETRATION FIRESTOPPING.

ROOF PENETRATIONS: Do not penetrate roof or flashing unless permitted, in writing, by the Architect-Engineer.

TRENCHING AND BACKFILL: The Electrical Contractor shall perform all excavation, trenching, and backfilling necessary to install his work. Trenches shall be run after final grades are established, and shall be run at 24 inches minimum depth from finished grades. Contact all underground utilities (electric, telephone, cable TV, gas, water, sewer) and establish locations of underground utilities prior to digging. Damages to underground utilities will be repaired by the Owner of the line, and the Contractor responsible for such damage will pay all costs of repairs. After completion of backfilling operations, restore the disturbed areas to their original condition by leveling, raking, seeding and mulching.

3-02 GROUNDING

CODE: Entire system shall be grounded and bonded in accordance with the requirements of Article 250 of the National Electrical Code. Comply with UL 467 for grounding and bonding materials and equipment. Comply with IEEE C2 grounding requirements.

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. Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

GROUND RODS: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated. Use Cadweld type “GT” or equivalent ground rod connectors as indicated on drawings.

GROUNDING BUS: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.

MAIN SERVICE: Electrical service shall be grounded to the building structural steel, to the main cold water pipe within 5-feet of entrance to the building (or to the nearest indoor metal water piping when the main is PVC), and to driven ground rods as required by the National Electrical Code. Grounding point shall be inside the Main service equipment.

FEEDERS AND BRANCH CIRCUITS: Each feeder raceway shall be bonded to every cabinet, pull box, etc., to which it is connected by grounding bushings and bonding jumpers sized per NEC Table 250.122. Each branch circuit raceway must be connected to every cabinet, pull box, outlet box, etc., with double locknuts. Separate grounding conductors shall be installed on all feeders and on all lighting, receptacle and equipment branch circuits, whether indicated on the drawings or not. Size per NEC 250.122.

RECEPTACLES AND FIXTURES: Bond grounding terminal of each receptacle and fluorescent fixture to its outlet box with No. 12 green ground wire. Self-grounding receptacles are not acceptable as a substitute for this requirement.

GROUND ROD TESTS: Prior to connecting ground rods to ground ring or grounding conductor, each ground rod shall be tested for earth resistance. Test method shall be Biddle fall of potential method, or approved equivalent method. Notify Engineer seven (7) calendar days prior to performing testing. Tests shall not be performed within seven (7) days of measurable rainfall (greater than 0.01 inches). Should the resistance of any ground rod exceed 25 ohms, or lesser value when specified, notify Engineer for further action. Furnish to the Engineer a written certification of the testing, listing each ground rod as identified in the Drawings, and the resulting value of resistance, and any further corrective action taken.

3-03 RACEWAYS

WIRING: All wiring shall be installed in raceways, unless noted. Raceways shall be run concealed, unless noted.

UNDERGROUND FEEDER CONDUIT, COMMUNICATIONS CONDUIT, AND DUCT BANKS:

1) Use GRC or PVC schedule 40 for underground conduit and duct bank installations.
2) Where required concrete encasement shall be either 2000 psi or 3000 psi.
3) For concrete encased conduits use manufactured PVC spacers and mounts for support and spacing of the conduits. Do not use concrete blocks, pipes, or other means to support and space conduits that are to receive concrete encasement.
4) A metallic backed marking tape shall be installed 12” above all underground feeder conduits, service entrance communications conduit, and duct banks.

MAIN SERVICE:

1) Main Service shall be run in GRC where run exposed or concealed in walls or ceilings.
2) Main Service shall be run in GRC or Schedule 40 PVC encased in concrete with 2-inches minimum concrete encasement on all sides where run underground (Schedule 40 PVC is not required to be encased in conduit where run under the concrete floor slab).
3) Where PVC is used, elbows for turn-outs and risers shall be GRC, PVC is not permitted above grade. EXCEPTION: Plastic conduit may enter floor mounted switchboards, motor control centers, or other floor mounted enclosures.
4) Metal conduits installed in contact with earth shall be painted with 2 coats Rustoleum paint or other acceptable preservative.

FEEDERS:

1) Feeders shall be run in GRC or IMC where run exposed.
2) Feeders shall be run in GRC, IMC, or EMT where run concealed in walls or ceilings.
3) Feeders shall be run in GRC or Schedule 40 PVC encased in concrete with 2-inches minimum concrete encasement on all sides where run underground (Schedule 40 PVC is not required to be encased in conduit where run under the concrete floor slab).
4) Where PVC is used, elbows for turn-outs and risers shall be GRC, PVC is not permitted above grade. EXCEPTION: Plastic conduit may enter floor mounted switchboards, motor control centers, or other floor mounted enclosures.
5) Metal conduits installed in contact with earth shall be painted with 2 coats Rustoleum paint or other acceptable preservative.

BRANCH CIRCUITS:

1) Branch circuits shall be run concealed where practical.
2) Branch circuits run concealed in walls or ceilings shall be run in EMT, GRC, or IMC, except that Type MC Cable and Type MC-PCS Cable may be used for branch circuits as indicated in 3.04 below.

3) Branch circuits run exposed to weather (wet or damp location) on exterior walls, canopies, ceilings, or on roofs shall be run in GRC or IMC with screwed fittings.
4) Branch circuits run exposed in dry, finished spaces shall be run in Wiremold surface metal raceway.
5) Branch circuits run exposed in interior damp locations, unfinished spaces (attics), and unoccupied spaces (storage room, equipment rooms, janitor's closet) may be run in EMT in lieu of Wiremold.
6) Branch circuits run underground shall be run in GRC, IMC, or Schedule 40 PVC plastic conduit.
7) All interior conduit homeruns to panelboards shall be run overhead in EMT, GRC, or IMC unless noted otherwise on the drawings.
8) Underground conduits shall be run 24" minimum below grade.
9) Metal conduits installed in contact with earth shall be painted with 2 coats Rustoleum paint or other acceptable preservative.
10) Where plastic conduits are indicated, transition from plastic to GRC or IMC below grade or slab and rise with GRC or IMC. PVC is not permitted above grade. EXCEPTIONS: 1) Plastic conduit may enter floor mounted switchboards, motor control centers, or other floor mounted enclosures. 2) Plastic conduit risers are acceptable where run concealed from underfloor conduit to receptacle or switch boxes in masonry walls.

FLEXIBLE CONDUITS: Recessed light fixtures located in accessible ceilings may be connected to an outlet box above the ceiling thru flexible conduit "whips". Run a separate ground wire in all conduit, including flexible fixture whips. DO NOT loop flexible conduit from one fixture to another. Manufacturer-supplied Metal-clad cable fixture whips (#18 AWG) shall be permitted for light fixture whips provided they include a ground wire and do not exceed 6' in length.

Final connections to motors, motor driven equipment, transformers, and vibrating equipment shall be made thru flexible conduit, 36" maximum length. "Sealtite" flexible metal conduit shall be installed outdoors, in equipment rooms, and in wet locations.

PULL WIRES: Raceways for wiring by others or for future shall contain a No. 14 galvanized steel pull wire or equivalent plastic cord with 200 lb. tensile strength.

INSTALLATION: Ream raceways, butt ends into couplings, 3 quarter bends per run maximum, plug raceways until wiring is pulled in place. Exposed conduits shall be run parallel and perpendicular to walls, floor, and ceiling. Multiple conduit runs shall be racked using Unistrut or Kindorf channels and pipe clamps. Install conduits in concrete slabs between the top and bottom layers of reinforcing steel. Maximum size of conduits in slabs is 1 inch. Crossing of conduits in slabs shall be avoided, if possible.

PULL BOXES: Maximum length between pull points shall be 200 ft. for pulls with two 90 degree bends, and 100 ft for pulls with three 90 degree bends. Furnish and install pullboxes, junction boxes, handholes, or conduit bodies where bends or pulling lengths exceed these specifications.

EXPANSION JOINTS: Furnish and install expansion joints where conduit crosses building expansion joints and for straight runs exceeding 100 ft. in length.

PLASTIC CONDUIT: Do not damage conduit while making field bends and offsets, cutting and joining conduit. Use GRC elbows where length between pulls exceeds 100 ft. Clean conduit prior to applying solvent. Ensure that conduit extends fully into coupling or fitting when making joints.

MINIMUM SIZE: Home runs to panelboards shall be 3/4" minimum, otherwise raceways shall be 1/2" minimum, except that flexible conduit shall be 3/8" minimum.

FIRESTOPPING: Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

TEST AND INSPECTIONS: After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3-04 WIRE AND CABLE

MINIMUM SIZE: No. 12 for power circuits, No. 16 for control circuits, unless noted. Where home run exceeds 75 ft. length on 120 volt circuits, use No. 10 minimum.

COLOR CODE: No. 12 and No. 10 shall have color-coded insulation. No. 8 and larger shall be marked at all terminals and joints with color-coded tape. Color code as follows:

Voltage	Phase A	Phase B	Phase C	Neutral	Grounding
240/120	Black	Orange	Blue	White	Green
208/120	Black	Red	Blue	White	Green
480/277	Brown	Orange	Yellow	Gray	Green

INSTALLATION: Ensure that raceway system is complete and that conductors will be free from moisture or physical damage prior to installing conductors. Install all conductors at the same time. Do not exceed cable manufacturer's recommended pulling tension for conductors. Where required, lubricate cables with Ideal Yellow 77, Burndy Slikon, or other acceptable cable lubricant. Do not use lubricants that are not acceptable to the Architect-Engineer.

SPLICING: Splices on Sizes No. 10 and smaller shall be made with wire nuts. Splices on Sizes No. 8 and larger shall be made with split bolt connectors, compression connectors, or solderless lugs. Splices shall be insulated with two or more layers of Scotch 23 rubber tape covered with two or more layers of Scotch 33 plastic tape, or acceptable equivalent method.

CONNECTIONS: Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Absent published values, use those specified in IL 486A and UL 486B.

MULTIWIRE BRANCH CIRCUITS: Shared or common neutrals are not permitted on this project for multiwire branch circuits. The Contractor shall pull a separate neutral for all 120V & 277V circuits.

0-10V DIMMING: Where 0-10V wiring is installed using Class 2 wiring methods it shall not be run in the same raceway as any line voltage or Class 1 circuits. Where 0-10V wiring is run in the same raceway as line voltage or Class 1 circuits it shall be reclassified and installed as Class 1 circuits per NEC 725.130(A), and the Class 2 markings shall be eliminated and the entire circuit installed using the wiring methods and materials in accordance with Part II, Class 1 Circuits of NEC 725.

TYPE MC / Type MC-PCS CABLE: Type MC / Type MC-PCS cable may be used for interior, concealed lighting branch circuits located above accessible lay-in ceilings and receptacle branch circuits located in stud walls or above accessible lay-in ceilings, except that homeruns to panelboards shall be in EMT. Type MC / Type MC-PCS Cable may not penetrate rated walls or floors and may not be used underground or under slab. Type MC / Type MC-PCS Cable shall be supported in accordance with the requirements of NEC 330.30.

3-05 BOXES

WALL OUTLETS: Flush mounted, unless noted. Boxes shall be securely mounted to wall studs or be grouted in masonry. Boxes shall have single or multi-gang plaster rings, as required. "Through-wall" boxes SHALL NOT BE USED. Back-to-back mounting of boxes is not permitted. Boxes on

opposite sides of a rated wall shall have a minimum of 24" horizontal spacing or shall be protected with listed putty pads. Locate boxes so that cover or plate will not span different building finishes.

RECESSED BOXES IN MASONRY WALLS: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

RECESSED BOXES IN STUD WALLS: Support boxes from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CEILING OUTLETS: Flush mounted or concealed above ceiling. Boxes for fixture support shall have studs or ears as required and shall be securely supported by adjustable bar hangers or steel angle.

JUNCTION BOXES, PULL BOXES, AND WIREWAYS: Shall be sized and installed as indicated on the drawings or where required by NEC for pulling or splicing wiring. All junction boxes and pull boxes shall be accessible. Junction boxes and pull boxes shall not be located above inaccessible ceilings.

HANDHOLES: See details on drawings.

LOCATIONS: Verify door swings and mount switches on strike side, 6" from jamb. Verify counter heights and arrangement prior to setting boxes. The Owner reserves the right to move any outlet by as much as 10 ft. from its indicated location at no additional cost, provided the Contractor is notified prior to roughing in.

3-06 WIRING DEVICES

INSTALLATION: Devices shall be installed as indicated on the drawings and wired in accordance with the manufacturer's instructions. Install conductors at each outlet with at least 6-inches of slack.

MASKING: Devices shall be masked to prevent painting of faces and handles during construction. Do not install cover plates until clean-up has been completed.

COVER PLATES: Cover plates shall be installed on all wiring devices, telephone/data outlets, junction boxes, and outlet connections. Install blank stainless steel cover plates for any unused telephone/data outlets.

3-07 LIGHTING AND LIGHTING CONTROLS

INTERIOR LIGHTING

1) LOCATION: Install fixtures symmetrically on ceiling or ceiling grid as indicated on the drawings and as directed on the job.
2) MOUNTING: Support all fixtures securely from structural or framing members with adjustable bars, metal angles, threaded rods or other acceptable methods - Installation shall comply with NEC 314.27. Support recessed fixtures as specified in paragraph 3-01 - Installation shall comply with NEC 410.36(B).
3) SUSPENDED LIGHTS (FINISHED CEILINGS): Suspended linear direct/indirect fixtures in classrooms, offices, conference rooms, and other finished interior spaces shall be suspended using aircraft cable as indicated on the drawings, unless noted otherwise.
4) SUSPENDED LIGHTS (EXPOSED CEILINGS): Suspended industrial fixtures, high-bay fixtures, low-bay fixtures, etc. located in gymnasiums, warehouses, industrial facilities, and other larger spaces with exposed ceilings shall be suspended using threaded rods and the Electrical Contractor shall furnish and install unistrut or other structural member as required to

support fixtures. Mount so bottom of fixture is as close to bottom of beam or truss as possible, unless noted otherwise.

LIGHTING CONTROLS

1) QUALITY CONTROL: Verify operation of each lighting control device, and adjust time delay and sensitivity settings. Lighting control devices that fail tests and inspections are defective work. See details and notes on drawings for additional information.
2) ADJUSTING: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. See details and notes on drawings for additional information.
3) DEMONSTRATION: Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training." See details and notes on drawings for additional information.

3-08 SWITCHGEAR

SAFETY SWITCHES: Mount switches where shown on drawings and within sight of equipment served. Mount in a readily accessible location unless noted. Verify fuse sizes with equipment manufacturer's requirements.

PANELBOARDS

1) INSTALLATION: Mount panelboards so that the center grip of the operating handle of the highest circuit breaker in the panelboard is not more than 6’-7” (2.0 meters) above the floor when in its highest position per the requirements of NEC 240.24(A). Bottom of panelboard to be a minimum of 12” above the floor except where a lower height is required to comply with NEC 240.24(A). Connect circuits as indicated on the drawings, observing correct color code and numbering. Mark all wires in panelboard with circuit number.
2) DIRECTORY: Provide typewritten circuit directory for each panel identifying load served and room location. Identify spares in pencil. Panelboard schedules must comply with NEC 408.4, including listing room description and room number for each load. Turn all spare breakers off.

NAMEPLATES AND WARNING SIGNS: Verify identity of each item before installing identification products. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

ARC-FLASH HAZARD WARNING LABELS: Provide warning labels for all panels, switchboards, switchgear, and industrial control panels per the requirements of NEC 110.16. Labels to read,

DANGER ARC FLASH & SHOCK HAZARD
APPROPRIATE PERSONAL PROTECTION
EQUIPMENT REQUIRED

3-09 COMPLETION OF WORK

TESTS AND FINAL REVIEW: Upon completion of work, the entire system shall be completely operational and tested to conform with these specifications and drawings, and shall be reviewed by the Architect-Engineer. All defects in workmanship and material shall be immediately corrected without additional compensation to the Contractor.

The final review of the electrical installation by the Engineer cannot be provided until the following items have been submitted to the Engineer for review:

1) Letter from the Electrical Contractor on company letterhead indicating that the installation is complete and ready for a final review.

Failure to submit the above documentation prior to requesting the Engineer's Final Review of the project may result in delays in providing the final review. The Engineer assumes no liability for delays in the project resulting from failure to provide the proper documentation.

The system will not be considered complete until Record Documents are provided and training of facility personnel on the system operation is complete. This facet of the services to be provided by the Contractor is deemed very important to the satisfactory completion of the contract and the installation cannot be deemed complete until these services have been provided in accordance with the Contract Documents.

CLEAN UP: Upon completion of all installations and prior to final acceptance by the Owner, remove all debris from the site. Clean and touch up paint on fixture lenses and trims, cabinets, enclosures, cover plates, etc.

END OF SECTION 260500

PART 1 - GENERAL REQUIREMENTS

1-01 SUMMARY

Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1-02 ELECTRICAL SUBMITTALS

Electrical shop drawings shall be submitted in one complete package containing all items required by this specification and all other Division 26-28 specifications. Partial shop drawing submittals may be rejected by the Architect-Engineer.

Exceptions: Fire Alarm System CAD drawings, Lighting Control System CAD drawings, and Allowanced Light Fixtures may be submitted separately if additional time is needed to prepare these shop drawings. Submit written request to Architect/Engineer for extension with a timeline schedule indicating submittal date for items to be submitted separately.

Electrical shop drawings shall be transmitted to the Architect, to the Engineer of Record, and to Vicki Sweat (vicki@simsgroupusa.com). Where Construction Management software such as Procore or Submittal Exchange is used, then Engineer of Record for Sims Group and Vicki Sweat shall be added as users for electrical submittals.

1-03 ELECTRICAL SUBMITTAL FORMAT

FILE TYPE: Electrical submittals to be submitted digitally and shall be searchable pdf documents divided into categories as indicated below.

SUBMITTAL TRANSMITTAL LETTER: The submittal package shall include a single transmittal letter saved as a separate pdf file indicating the following:

- The project name and address
- The date of submission
- The Electrical Contractor name and address
- The General Contractor name and address
- The Construction Manager name and address (if applicable)
- A list of each submittals category (use categories listed below)
- Any applicable remarks and/or comments
- Signature of transmitter

SUBMITTAL CATEGORY COVER SHEET: The digital submittal shall be divided into submittal categories as indicated below. **Each submittal category shall be saved as a separate pdf file with a cover sheet indicating the following:**

- The project name
- The submittal category (category names to match those listed below where applicable)
- The date of submission
- The Electrical Contractor name and address
- The name and address of the firm or entity that prepared the submittal.
- Any applicable remarks and/or comments

Submittals not meeting the above criteria may be rejected.

Refer to the sample Category Cover Sheet at the end of this specification section.

ELECTRICAL SUBMITTAL CATEGORIES: Within 45 days after award of contract and before any materials are delivered to the site, submit a digital set of Electrical Submittals in pdf format to the Architect-Engineer on each of the following categories/materials:

1) Section 260500, 2-03: Raceways and Fittings.
2) Section 260500, 2-04: Wire and Cable.
3) Section 260500, 2-05: Boxes and Wireways.
4) Section 260500, 2-06: Wiring Devices.
5) Section 260500, 2-07: Lighting Fixtures and Lighting Controls.
6) Section 260500, 2-08: Switchgear (Disconnect Switches, Circuit Breakers, Nameplates).
7) Section 260529: Hangers and Supports for Electrical Systems (Including Engineer's calculations where required).

OPTIONAL FEATURES: Clearly identify options requiring selection by Architect/Engineer.

RESUBMITTALS: Make resubmittals in same format as initial submittal. Note date and content of previous submittal. Note date and content of revision in label or title block and clearly indicate extent of revision.

DISTRIBUTION: Furnish copies of final reviewed submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms where applicable.

USE FOR CONSTRUCTION: Retain complete copies of submittals on Project site (either a digital copy or a hard copy is acceptable provided it is readily accessible). Use only final action submittals that are marked as such from the Engineer's action stamp.

1-04 ELECTRICAL SUBMITTAL SCHEDULE

SCHEDULE: Within 45 days after award of contract and before any materials are delivered to the site, submit a digital set of Electrical Submittals in pdf format to the Architect-Engineer. If additional time is needed, submit a written request to Architect/Engineer for extension with a timeline schedule indicating revised submittal date.

No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

No extension of the Contract Time will be authorized because of failure to transmit submittals in the proper format.

1-06 ELECTRICAL SUBMITTAL REJECTION

Failure to comply with the above criteria may result in rejection of the submittal by the Architect-Engineer. Refer to Division 1 for additional Submittal requirements.

PART 2 - NOT APPLICABLE

PART 3 - EXECUTION

3-01 CONTRACTOR'S ACTIONS

GENERAL: The primary purpose of submitting electrical shop drawings is to demonstrate the way by which the Contractor proposes to comply with the design concept expressed in the Contract Documents for the portions of work that require submittals.

CONTRACTOR REVIEW: Prior to submittal to the Engineer, the Contractor shall review shop drawings for compliance with the Contract Documents.

No electrical equipment or materials shall be ordered or installed by the Contractor prior to receipt of properly reviewed shop drawings. The Contractor may not perform any portion of the work for which the Contract Documents require submittal and review of shop drawings prior to receipt of properly reviewed shop drawings.

Failure to comply with the above criteria may require the removal by the Contractor of any equipment or materials installed prior to receipt of properly reviewed electrical shop drawings, at no cost to the Owner or the Architect/Engineer.

3-02 ENGINEER'S ACTIONS

GENERAL: Engineer will not review submittals that do not bear Contractor's approval/acceptance stamp and will return them without action.

ELECTRICAL SUBMITTALS: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate actions required.

INCOMPLETE OR PARTIAL SUBMITTALS: Incomplete or partial submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 260510

ELECTRICAL SUBMITTAL CATEGORY COVER SHEET

PROJECT NAME:	Sample Project Middle School
SUBMITTAL CATEGORY:	Section 260500, 2-06 Wiring Devices
DATE OF SUBMISSION:	May 01, 2023
ELECTRICAL CONTRACTOR:	ABCD Electrical Contractor, 123 Main Street, Anywhere, SC 29999
SUBMITTAL PREPARER:	WXYZ Lighting, Inc. 456 Elm Street Somewhere, SC 21111
REMARKS/COMMENTS:	Color selection needed for wiring devices.

PART 1 - GENERAL REQUIREMENTS

1-01 SUMMARY

SECTION INCLUDES:

1) Hangers and supports for electrical equipment and systems.
2) Construction requirements for concrete bases.

1-02 PERFORMANCE REQUIREMENTS

1) Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2) Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
3) Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
4) Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1-03 SUBMITTALS

1) Product Data: For steel slotted support systems.
2) Shop Drawings: Shop Drawings shall show fabrication and installation details and include calculations for the following:

    a. Trapeze hangers. Include Product Data for components.
    b. Steel slotted channel systems. Include Product Data for components.
    c. Equipment supports.

3) Welding Certificates.

1-04 QUALITY ASSURANCE

1) Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2) Comply with NFPA 70.

PART 2 - PRODUCTS

2-01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

1) Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        i. Allied Tube & Conduit.
        ii. Cooper B-Line, Inc.; a division of Cooper Industries.

iii. ERICO International Corporation.
iv. GS Metals Corp.
v. Thomas & Betts Corporation.
vi. Unistrut; Tyco International, Ltd.
vii. Wesanco, Inc.

c. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
d. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
e. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
f. Channel Dimensions: Selected for applicable load criteria.

2) Raceway and Cable Supports: As described in NECA 1 and NECA 101.
3) Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
4) 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.
5) Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
6) Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

a. 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.
i. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
ii. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- Hilti Inc.
- ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- MKT Fastening, LLC.
- Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

b. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
i. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
ii. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- Cooper B-Line, Inc.; a division of Cooper Industries.
- Empire Tool and Manufacturing Co., Inc.
- Hilti Inc.
- ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- MKT Fastening, LLC.

c. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
d. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
e. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
f. Toggle Bolts: All-steel springhead type.

g. Hanger Rods: Threaded steel.

2-02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

1) Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
2) Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3-01 APPLICATION

1) Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
2) Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
3) 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.
   a. Secure raceways and cables to these supports with two-bolt conduit clamps.
4) Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3-02 SUPPORT INSTALLATION

1) Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
2) 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.
3) 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 (90 kg).
4) 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:

   a. To Wood: Fasten with lag screws or through bolts.
   b. To New Concrete: Bolt to concrete inserts.
   c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   d. To Existing Concrete: Expansion anchor fasteners.
   e. 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 (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
   f. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts; beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69; or spring-tension clamps.
   g. To Light Steel: Sheet metal screws.

h. 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 by means that meet seismic-restraint strength and anchorage requirements.

5) Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3-03 INSTALLATION OF FABRICATED METAL SUPPORTS

1) Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
2) Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
3) Field Welding: Comply with AWS D1.1/D1.1M.

3-04 CONCRETE BASES

1) Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) 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.
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.

3-05 PAINTING

1) Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
2) Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
3) Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

APPENDIX ‘A’

MECHANICAL COMPLIANCE CERTIFICATE

COM*check* Software Version 4.1.5.5

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2007) Standard
Project Title:	SPRINGFIELD MS COOLER & FREEZER ENCLOSURE
Location:	Fort Mill, South Carolina
Climate Zone:	3a
Project Type:	Addition

Construction Site:	Owner/Agent:	Designer/Contractor:
FORT MILL, SC	FORT MILL SCHOOL DISTRICT	JCS ARCHITECTS

Mechanical Systems List

Quantity	System Type & Description
1	SHP-1/DAHU-1 (Single Zone): Split System Heat Pump Heating Mode: Capacity = 9 kBtu/h, Proposed Efficiency = 9.00 HSPF, Required Efficiency = 7.70 HSPF Cooling Mode: Capacity = 9 kBtu/h, Proposed Efficiency = 17.00 SEER, Required Efficiency: 13.00 SEER Fan System: None

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2007) Standard requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Brad Jasinski, P.E.	Brad Jasinski	2-27-23
Name - Title	Signature	Date

COMcheck Software Version 4.1.5.5

Inspection Checklist

Energy Code: 90.1 (2007) Standard

Requirements: 100.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 6.4.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2, 7.4.1 [PR3][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [PR5][1]	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft2.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.8 [FO9][3]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4, 6.4.1.5 [ME1][2]	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency:_____	Efficiency:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
6.4.3.4.1 [ME3][3]	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.5 [ME5][3]	Ventilation fans >0.75 hp have automatic controls to shut off fan when not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.9 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >40 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.1 [ME7][3]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.2 [ME8][2]	HVAC ducts and plenums insulated.	R-_____	R-_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9][2]	HVAC piping insulation thickness.	_____ in.	_____ in.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.1 [ME10][2]	Ducts and plenums sealed based on static pressure and location.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.2.3 [ME19][3]	Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.4.1 [ME25][3]	HVAC pumping systems >10 hp designed for variable fluid flow.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.6.1 [ME30][1]	Exhaust air energy recovery on systems >=5,000 cfm and 70% of design supply air.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.7.1 [ME32][2]	Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.2 [ME33][1]	Fume hoods exhaust systems >=15,000 cfm have VAV hood exhaust and supply systems, direct make-up air or heat recovery.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.8.1 [ME34][3]	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
10.4.1 [EL9][2]	Electric motors meet requirements where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.1 [FI2][2]	Heating and cooling to each zone is controlled by a thermostat control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.1.2, 6.4.3.2, 6.4.3.3, 6.4.3.3.1, 6.4.3.3.2 [FI3][2]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.5 [FI5][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.7 [FI6][3]	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.2 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.3 [FI9][1]	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft2 of conditioned area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.2 [FI20][1]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.1 [FI21][1]	HVAC systems equipped with at least one automatic shutdown control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.2 [FI22][1]	Setback controls allow automatic restart and temporary operation as required for maintenance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

APPENDIX "B"

LIGHTING COMPLIANCE CHECK

COMcheck Software Version 4.1.5.5

Interior Lighting Compliance Certificate

Project Information

Energy Code:	90.1 (2007) Standard
Project Title:	Springfield Middle School Cooler & Freezer Enclosure
Project Type:	New Construction

Construction Site: Fort Mill, SC Owner/Agent: Fort Mill School District Designer/Contractor:JCS Architects

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B X C)
1-Common Space Types:Active Storage	379	0.80	303
		Total Allowed Watts =	303

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
1-Common Space Types:Active Storage				
LED 1: A50/A50EM: Other:	1	6	38	228
			Total Proposed Watts =	228

Interior Lighting PASSES: Design 25% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 90.1 (2007) Standard requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Chris Partrich, PE — Name - Title

Signature

2/27/23 — Date

COMcheck Software Version 4.1.5.5

Exterior Lighting Compliance Certificate

Project Information

Energy Code:	90.1 (2007) Standard
Project Title:	Springfield Middle School Cooler & Freezer Enclosure
Project Type:	New Construction

Construction Site: Fort Mill, SC Owner/Agent: Fort Mill School District Designer/Contractor:JCS Architects

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B X C)
Attached canopy	226 ft2	1.25	Yes	282
			Total Tradable Watts (a) =	282
			Total Allowed Watts =	282
			Total Allowed Supplemental Watts (b) =	14

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.

(b) A supplemental allowance equal to 14 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Attached canopy (226 ft2): Tradable Wattage				
LED 1: C20: Other:	1	2	22	44
			Total Tradable Proposed Watts =	44

Exterior Lighting PASSES: Design 85% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 90.1 (2007) Standard requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Chris Partrich, PE — Name - Title

Signature

2/27/23 — Date

Inspection Checklist

Energy Code: 90.1 (2007) Standard

Requirements: 12.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
8.4.1.1, 8.4.1.2 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
9.4.1.1 [EL1][2]	Automatic controls to shut off all building lighting installed in buildings >5,000 ft2.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** N/A
9.4.1.2 [EL2][2]	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** E001 & E101
9.4.1.3 [EL3][2]	Automatic lighting controls for exterior lighting installed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** Tied to existing
9.4.1.4 [EL4][1]	Separate lighting control devices for specific uses installed per approved lighting plans.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** N/A
9.4.2 [EL5][3]	Ballasted one and three lamp fixtures with >30 W/lamp have two lamp tandem wired ballasts when >=2 fixtures in same space on same control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Electronic high-frequency ballasts.
9.4.3 [EL6][1]	Exit signs do not exceed 5 watts per face.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
9.4.4 [EL7][1]	Exterior grounds lighting over 100 W provides >60 lm/W unless on motion sensor or fixture is exempt from scope of code or from external LPD.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** N/A
9.6.2 [EL8][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** N/A

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
8.7.1 [FI16][3]	Furnished as-built drawings for electric power systems within 30 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Location on plans/spec:** N/A
8.7.2 [FI17][3]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
9.2.2.3 [FI18][1]	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Interior Lighting fixture schedule for values.*
9.4.5 [FI19][1]	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Exterior Lighting fixture schedule for values.*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

APPENDIX ‘C’

ENVELOP COMPLIANCE

COMcheck Software Version COMcheckWeb
Envelope Compliance Certificate

Project Information

Energy Code:	90.1 (2007) Standard
Project Title:	
Location:	Fort Mill, South Carolina
Climate Zone:	3a
Project Type:	New Construction

Construction Site: Fort Mill, SC Owner/Agent: Fort Mill School District Designer/Contractor: JCS Architects

Building Area	Floor Area
1-School/University : Nonresidential	1040

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Floor: Unheated Slab-On-Grade, [Bldg. Use 1 - School/University] (b)	1040	---	---	0.730	0.730
Roof: Insulation Entirely Above Deck, [Bldg. Use 1 - School/University]	1041	---	20.0	0.048	0.048
NORTH Ext. Wall: Steel-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	320	0.0	13.0	0.063	0.084
EAST Ext. Wall: Steel-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	830	0.0	13.0	0.063	0.084
SOUTH Ext. Wall: Steel-Framed, 16in. o.c., [Bldg. Use 1 - School/University]	320	0.0	13.0	0.063	0.084
WEST Int. Wall: Concrete Block, 8in., Partially Grouted, Cells Empty, Light Density, Furring: None, [Bldg. Use 1 - School/University]	830	---	0.0	0.366	0.580

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

Envelope PASSES: Design 4% better than code

Envelope Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 90.1 (2007) Standard requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

L. Todd Sease Principal — Name - Title

Signature

3/13/2023 — Date

Inspection Checklist

Energy Code: 90.1 (2007) Standard

Requirements: 0.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2 [PR1][1]	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.5.3.3 [FO1][1]	Below-grade wall insulation R-value.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.3.5 [FO3][1]	Slab edge insulation R-value.	R-____ ☐ Unheated ☐ Heated	R-____ ☐ Unheated ☐ Heated	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.2 [FO4][1]	Slab edge insulation installed per manufacturer's instructions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.3.5 [FO5][1]	Slab edge insulation depth/length.	____ ft	____ ft	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.7.3 [FO7][1]	Insulation in contact with the ground has <=0.3% water absorption rate per ASTM C272.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.4.3.2 [FR1][3]	Factory-built fenestration and doors are labeled as meeting air leakage requirements.	Fenestration____ _ cfm/ft^2 Doors_____ cfm/ft^2	Fenestration____ _ cfm/ft^2 Doors_____ cfm/ft^2	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.4.3a [FR8][1]	Vertical fenestration U-Factor.	U-_____	U-_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.3b [FR9][1]	Skylight fenestration U-Factor.	U-_____	U-_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.4.1 [FR10][1]	Vertical fenestration SHGC value.	SHGC:_____	SHGC:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.4.2 [FR11][1]	Skylight SHGC value.	SHGC:_____	SHGC:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.2.1, 5.8.2.4 [FR12][2]	Fenestration products rated in accordance with NFRC.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.2.2 [FR13][1]	Fenestration products are certified as to performance labels or certificates provided.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.2.3, 5.5.3.6 [FR14][2]	U-factor of opaque doors associated with the building thermal envelope meets requirements.	U-_____ ☐ Swinging ☐ Nonswinging	U-_____ ☐ Swinging ☐ Nonswinging	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.4.3.1 [IN1][1]	All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.3.1 [IN2][1]	Roof R-value. For some ceiling systems, verification may need to occur during Framing Inspection.	R-_____ ☐ Above deck ☐ Metal ☐ Attic	R-_____ ☐ Above deck ☐ Metal ☐ Attic	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.2, 5.8.1.3 [IN3][1]	Roof insulation installed per manufacturer's instructions. Blown or poured loose-fill insulation is installed only where the ceiling slope is <= 3:12.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.3.1.1 [IN5][3]	High-albedo roofs meet solar reflectance of 0.70 and thermal emittance of 0.75 or SRI of 82.	SR:_____ SRI:_____	SR:_____ SRI:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.3.2 [IN6][1]	Above-grade wall insulation R-value.	R-_____ ☐ Mass ☐ Metal ☐ Steel ☐ Wood	R-_____ ☐ Mass ☐ Metal ☐ Steel ☐ Wood	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.2 [IN7][1]	Above-grade wall insulation installed per manufacturer's instructions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.3.4 [IN8][1]	Floor insulation R-value.	R-_____ ☐ Mass ☐ Steel ☐ Wood	R-_____ ☐ Mass ☐ Steel ☐ Wood	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.1 [IN10][2]	Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.4 [IN11][2]	Eaves are baffled to deflect air to above the insulation.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.5 [IN12][2]	Insulation is installed in substantial contact with the inside surface separating conditioned space from unconditional space.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.6 [IN13][2]	Recessed equipment installed in building envelope assemblies does not compress the adjacent insulation.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.8.1.7 [IN14][2]	Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.7.1 [IN15][2]	Attics and mechanical rooms have insulation protected where adjacent to attic or equipment access.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.7.2 [IN16][2]	Foundation vents do not interfere with insulation.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.8.1.8 [IN17][3]	Insulation intended to meet the roof insulation requirements cannot be installed on top of a suspended ceiling. Mark this requirement compliant if insulation is installed accordingly.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
5.4.3.3 [FI1][1]	Weatherseals installed on all loading dock cargo doors in Climate Zones 4-8.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)