100% Construction Documents

VERO BEACH HIGH SCHOOL
FRESHMAN LEARNING CENTER
SINGLE POINT OF ENTRY ADDITION

1507 19TH Street
Vero Beach, Florida 32960

October 17, 2018

School District of
Indian River County

6500 57th Street
Vero Beach, Florida 32967

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Project Manual

VERO BEACH HIGH SCHOOL
FRESHMAN LEARNING CENTER
SINGLE POINT OF ENTRY ADDITION

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GENERAL REQUIREMENTS

SECTION 01 11 00
SUMMARY OF WORK/CONTRACTOR CONDUCT ON CAMPUS

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Work covers construction of a Single Point of Entry Addition at Vero Beach High School, Freshman Learning Center.
   1. School Location: 1507 19th Street, Vero Beach, Florida 32960
B. General Conditions of the Contract cover additional requirements of all Parties to the Contract.

1.2 WORK SEQUENCE

A. Coordinate, sequence, and stage new work in accordance with approved Construction Schedules and safety plan.
B. Coordinate access, parking, and egress of all Contractor Personnel prior to commencing construction.
C. Construct Work in stages to provide for public and Owner's safety at all times including coordination with the local Fire Department for approval of ingress/egress with construction fencing.
D. Working Hours shall be in accordance with applicable City Ordinances and/or in compliance with the Owner's directions.

1.3 CONTRACTOR USE OF PREMISES

A. Confine operations at site to areas permitted by Law, Ordinances, Permits, and Contract Documents.
B. Do not encumber site with materials or equipment.
C. Refer to Section 01 35 16 for provisions on safety, security, maintenance of access and operations, maintenance of existing utilities and services and building access restrictions.

1.4 SITE RESTRICTIONS AND REQUIREMENTS FOR ALL PROJECTS

A. The designated superintendent/foreman shall sign in and out all workers on a daily basis.
   1. All visitors to the site shall sign in on the Site Visitors Log kept in the School District Construction Office trailer or other designated location.
B. All Contractors, Subcontractors, and other construction employees shall wear District issued plastic laminated Identification cards at all times.
C. Report all construction site accidents to the School Board Project Manager the same day they occur.
   1. Provide copies of accident reports and police reports to the School District Project Manager the day they occur.
D. All Contractors, Subcontractors, and other construction employees shall park their vehicles in the designated construction site staging area, or off site as may be required.
   1. The staging area shown on the drawings is conceptual and modifications may be coordinated with the District as necessary.
E. No firearms or other weapons allowed on the site.
F. No Smoking in school buildings
G. No alcohol or drugs on campus

1.5 STUDENT OCCUPIED CAMPUS SPECIAL REQUIREMENTS

A. Project personnel shall not communicate with students, except to warn of danger or to order out of the construction site.
B. Project personnel shall not enter student occupied areas while students are on campus, except in emergencies or with the permission and knowledge of the school staff and the District's construction project representative.
C. NO SMOKING, ALCOHOL, or non-Prescription DRUGS on any part of the school property, whether the school is in session or not.
D. No firearms or other weapons allowed on the site.
E. The use of radios, tape and C.D. players is limited to the contractor’s trailer and unoccupied school campuses, keep the volume level set to prevent being heard on the active student campus or neighboring properties.
F. Project personnel shall wear appropriate clothing, shall not have any foul or vulgar language visible on the clothing.
G. Project personnel shall not use foul or vulgar language while students and staff are on campus.
H. Do not bring or keep animals on the site.
I. Comply with all requirements of FBC Section 423 - State Requirements for Educational Facilities.

1.6 DAILY LOG

A. The Contractor shall keep a daily log of the construction progress and include the construction site equipment utilized each day.
B. Provide one copy to the School District Project Manager weekly.

1.7 ITEMS NOT IN CONTRACT

A. Items under this contract include all work indicated on the contract documents, unless specifically noted as "Not in Contract" (N.I.C.).

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing prime Contractor's Schedule of Values.
   1. Coordinate the Schedule of Values with the Applications for Payment, Project Schedule, Submittal Schedule, and List of Subcontracts.
   2. Contractors using computer generated AIA Forms must submit a copy of their license, including license number, with each request for payment.

B. Progress payments will not be processed without an approved Schedule of Values on file.

1.3 SCHEDULE OF VALUES

A. Coordination: Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with the Project Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
      a. Project Schedule.
      b. Application for Payment forms, including Continuation Sheets.
      c. List of subcontractors.
      d. Schedule of allowances.
      e. Schedule of alternates.
      f. List of products.
      g. List of principal suppliers and fabricators.
      h. Schedule of submittals.
   2. Within 15 days of award of Contract, each awarded Contractor shall submit to the Architect a Schedule of Values, for approval, showing accurate costs for the items of work assigned to the Contractor, defined under Section 01 11 00 – Summary of Work.
   3. Subschedules: Where Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. The Schedule of Values shall include at a minimum a line item for labor and material costs for each specification section assigned to the Contractor under Section 01 11 00 – Summary of Work, and shall further divide the work into a sufficient number of individual work items to serve as an accurate basis for Contractor's Application for Payment. Each work item shall receive its prorated share of profit and overhead, including a line item for closeout. The Schedule of Values shall consist of a complete breakdown of the Contractor's contract sum showing the various items of work,

divided so as to facilitate the approval of payments to the Contractor for Work completed. In addition to and conjunctive with the division of various items of work, the breakdown shall separate individual buildings within the project shall separate sitework from building(s) components, and shall separate remodeling/renovation work from new construction work. The Schedule of Values shall be prepared in a format as directed by the Architect, showing the breakdown of items of Work and supported by such data to substantiate its correctness as the Architect may require. The contract breakdown shall be the same form as that to be used in submitting request for payments as covered by Article 9, of the General and Supplementary Conditions. Each item of Work shall have indicated a separate cost of labor and material. This schedule when reviewed by the Architect and Owner shall be used as the basis of approving payments along with establishing percentages of Work complete.

1. Identification: Include the following Project identification on the Schedule of Values:
    a. Project name and location.
    b. Name of the Architect.
    c. Project number.
    d. Contractor's name and address.
    e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed.
    a. Related Specification Section or Division.
    b. Description of Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value.
    h. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. In addition to the sections assigned to the Contractor as defined above, Contractors shall include the following line items on their Schedule of Values:
    a. Bonds: Performance, Labor and Material (if required).
    b. Mobilization.
    c. Demobilization – costs shall be equal to or greater than any mobilization costs.
    d. Insurance/Hazcom/Safety.
    e. Submittals in the amount of 2 percent of the Contract; however, not less than $1,000.00 or more than $15,000.00.
    f. Project Meetings in the amount of $250.00 times the anticipated number of meetings the Contractor will be required to attend during the course of the Project.
    g. Costs for Administration of Owner Direct Purchase Program.
    h. Daily cleanup (in the amount of 1 percent of the total contract amount).
    i. Closeout in an amount equal to 1 percent of the Contract amount; however, not less than $500.00 or more than $10,000.00.
4. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items. Schedule of Values shall be coordinated with the Construction Schedules such that the percentages of Work completed closely relates to the values for the Work shown on the request for payments. At the beginning of the Project, the

Contractor shall prepare a schedule of monthly progress payments showing the amount the Contractor may require for the Work proposed to be completed. The purpose of this schedule is to allow the Owner to determine what amounts of funds will be required to have available each month during the progress of construction for progress payments.

5. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
7. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
9. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
10. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

C. Schedule of Values shall be typed or printed on AIA Documents G702-1992 and G703-1992.
D. Each Schedule of Values shall have the Contractor's name, Bid Category name and number, project name and number and shall be dated and signed.
E. Should the Schedule of Values be "rejected, resubmit", resubmittal is due within 5 days of receipt of rejected schedule.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Coordination and project conditions
   2. Field engineering
   3. Preconstruction meeting
   4. Site mobilization meeting
   5. Progress meetings
   6. Pre-installation meetings
   7. Alteration project procedures

1.3 COORDINATION AND PROJECT CONDITIONS

A. Coordinate the scheduling, submittals, and Work of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
B. Verify utility company requirements and characteristics of operating equipment are compatible with building utilities.
   1. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
C. Coordinate space requirements, supports, and installation of mechanical and electrical work as indicated diagrammatically on Drawings.
   1. Require coordination drawings from each trade identifying routing of work, openings required in or under structure and possible conflicts.
   2. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building.
   3. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction.
   1. Coordinate locations of fixtures and outlets with finish elements.
E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
G. Owner will not consider change orders for extra work required by the Contractor due to poor coordination by the Contractor.

H. Coordinate scheduling of Contractor Startups, submission of Operations & Maintenance Manuals, Functional Performance Testing, and Owner's Training.

1.4 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Florida and acceptable to the Architect and Owner.
B. Contractor shall locate and protect survey control and reference points.
C. Control datum for survey is that established by Owner provided survey.
D. Verify setbacks and easements; confirm drawing dimensions and elevations.
E. Provide field-engineering services.
   1. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
F. Submit a copy of site drawing and certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

1.5 PRECONSTRUCTION MEETING

A. Owner will schedule a conference after Notice to Proceed.
B. Attendance required by the Owner, Architect, and Contractor.
C. Agenda:
   1. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule
   2. Designation of personnel representing the parties in Contract, and the Architect
   3. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures
   4. Scheduling
   5. Scheduling activities of a Geotechnical Engineer
   6. Issuance of Notice to Proceed
   7. Use of premises by Owner and Contractor
   8. Owner's requirements and partial occupancy
   9. Construction facilities and controls provided by Owner
   10. Survey and building layout
   11. Security and housekeeping procedures
   12. Application for payment procedures
   13. Procedures for maintaining record documents
   14. Requirements for start-up of equipment
   15. Inspection and acceptance of equipment put into service during construction period
D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.
B. Arrange for meetings, prepare agenda with copies for participants, and preside at meetings.
C. Attendance Required Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
D. Agenda:
   1. Review minutes of previous meetings
   2. Review of Work progress

3. Field observations, problems, and decisions
4. Identification of problems that impede planned progress
5. Review of submittals schedule and status of submittals
6. Review of off-site fabrication and delivery schedules
7. Maintenance of progress schedule
8. Corrective measures to regain projected schedules
9. Planned progress during succeeding work period
10. Coordination of projected progress
11. Maintenance of quality and work standards
12. Effect of proposed changes on progress schedule and coordination
13. Other business relating to work

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

1.7 PREINSTALLATION MEETING

A. When required in individual specification section, convene a pre-installation meeting at the site prior to commencing work of the section.
B. Require attendance of parties directly affecting, or affected by, work of the specific section.
C. Notify Owner and Architect five working days in advance of meeting date.
D. Prepare agenda and preside at meeting:
   1. Review conditions of installation, preparation and installation procedures.
   2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

1.8 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in Product sections; match existing Products and work for patching and extending work.
B. Employ skilled and experienced installer to perform alteration work.
C. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
D. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original or specified condition.
E. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
F. Where new Work abuts or aligns with existing, provide a smooth and even transition.
   1. Patch work to match existing adjacent work in texture and appearance.
G. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to the Architect for review.
H. Where a change of plane of 1/4" or more occurs, submit recommendation for providing a smooth transition to Architect for review.
I. Patch or replace portions of existing surfaces, damaged, lifted, discolored, or showing other imperfections.
J. Finish surfaces as specified in individual Product sections.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
   1. Shop drawings.
   2. Product data.
   3. Samples.

1.3 SUBMITTAL PROCEDURE

A. Submittals are to be submitted directly to the Architect.

B. Subcontractors on this Project shall provide submittals in accordance with the requirements of this Section. Where a submittal is required by a Subcontractor but assistance needed from others, the General Contractor shall participate and coordinate the submittal.

C. Where submission of samples, shop drawings, or other items are required from suppliers or subcontractors, it shall be the responsibility of the General Contractor to see that the submittal items required are complete and properly submitted, and corrected and resubmitted at the time and in the order required so as not to delay the progress of the Work. Submittals shall be made through the General Contractor.

D. The General Contractor shall check shop drawings, samples, and other submittals and submit them to the Architect with a letter of transmittal giving its approval, comments, and suggestions. Each transmittal shall include the following information:
   1. Date submitted.
   2. Project title and number.
   3. Contractor's name and address.
   4. Identification by Specification Section and quantity submitted for each submittal including name of subcontractors, manufacturer, or supplier.
   5. Notification of deviations from the Contract Documents for each submittal.
   6. Contractor's written approval marked on each submittal.

E. The General Contractor shall prepare, review, and stamp with his approval and submit, with reasonable promptness or within the specified time periods and in orderly sequence so as to cause no delay in the Work submittals required by these Contract Documents or subsequently required by modifications.

F. The Architect shall review and take action on submittals with reasonable promptness, so as to cause no delay in the progress. A reasonable period of time in accordance with approved project schedule for review of and action taken on submittals shall be as specified herein, but in no case shall it be less than 10 calendar days from the time it is received by the Architect until the time the submittal is marked and forwarded or returned. General Contractor shall

allow sufficient mailing time for submittals.

1.4 SHOP DRAWINGS

A. The General Contractor shall perform no portion of the Work requiring submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be in accordance with approved submittals.

B. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the bases of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

1. Autocad Drawings: Disk copy of Drawings may be available from the Architect. The Contractors requiring this service must contact the Architect to verify availability. Cost to obtain Autocad Drawings will be $40.00 per drawing file. Request for disk copy should be addressed to the Project Architect, and will be required to complete an authorization to use copyrighted material and waiver of liability form.

C. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared by the Contractor or subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

1. Advertising brochures will not be accepted as shop drawings.
2. Erection and setting drawings as referred to in these Specifications will be considered as shop drawings and shall be submitted along with detailed shop drawings.
3. Where schedules are required to indicate locations, they shall be submitted as part of the shop drawings package for that item.
4. Shop drawings and schedules shall repeat the identification shown on the Contract Drawings.
5. Include the following information:
    a. Dimensions.
    b. Identification of products and materials included by sheet and detail number.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurements.

D. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, Subcontractor, submittal name, and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Architect's "action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through the Contractor will be returned "without action."

E. By approving and submitting shop drawings, the General Contractor thereby represents that it has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data, and that he has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents prior to submitting to the Architect. Submittals which are received from sources other than through the General Contractor will be returned without review, requiring resubmittal.

F. The General Contractor shall have corrections required by the Architect made and shall resubmit the required number of corrected copies of shop drawings until appropriately marked. The General Contractor shall direct specific attention in writing or on resubmitted

shop drawings to revisions other than the corrections requested by the Architect on previous submissions.

G. The Architect will review shop drawings only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Architect's review of a separate item shall not indicate review of an assembly in which the item functions.
   1. Only shop drawings, product data, and samples marked "No Exceptions Taken" or "Note Markings/Confirm" shall be considered "final" and used in conjunction with the work of this Project.

H. The Architect's review of shop drawings shall not relieve the General Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the General Contractor has informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation, nor shall the Architect's action relieve the General Contractor from responsibility for errors or omissions in the shop drawings.
   1. The Architect's review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and qualities, or for substantiating instructions or performance of equipment or systems, all of which remain the responsibility of the General Contractor as required by the Contract Documents. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences, or procedures. The Architects approval of a specific item shall not indicate approval of an assembly of which it is a component.

I. Notations and remarks added to shop drawings by the Architect are to insure compliance to Drawings and Specifications and do not imply a requested or approved change to contract cost.

J. Should deviations, discrepancies, or conflicts between shop drawings and the Contract Documents (Contract Drawings and Specifications) be discovered, either prior to or after review, the Contract Documents shall control and be followed.

K. The following number of shop drawings and product data submittals shall be made on this Project. Where an insufficient number of copies are submitted, no action will be taken until the proper number of copies has been received. Additional copies beyond the number required will be discarded.

<u>Schedule of Required Shop Drawings and Product Data</u>

1. Architectural/Structural:
   - Submit: 6 copies
   - Distribution:
   - 1 copy - Architect
   - 1 copy - Owner's Representative
   - 4 copies - General Contractor
     - 1 copy – General Contractor's Office File
     - 1 copy - Field Copy (Job Record)
     - 1 copy - Supplier or Subcontractor
     - 1 copy Owner's Manual
2. Mechanical/Electrical:
   - Submit: 9 copies
   - Distribution:
     - 1 copy - Engineer

- 1 copy – Architect's Office File
- 1 copy – Owner's Representative
- 6 copies - General Contractors
  - 1 copy – General Contractor's Office File
  - 1 copy - Field Copy (Job Record)
  - 3 copies – Owner's Manual
  - 1 copy - Supplier or Subcontractor

L. Shop drawings not requested by the Architect/Engineer shall be returned without action.

M. Shop drawings will be marked as follows: General Contractor shall take the following action for each respective marking:

1. "NO EXCEPTIONS TAKEN" - Copies will be distributed as indicated under above schedule.
2. "NOTE MARKINGS/CONFIRM" - Final but Restricted Release; General Contractor may proceed with fabrication, taking into account the necessary corrections on submittal and with Contract Documents. General Contractor must submit a confirmation letter to remove restriction and allow shop drawings on the project site. A sample of a confirmation letter is enclosed herein.
3. "NOTE MARKINGS/RESUBMIT" - General Contractor may proceed with fabrication, taking into account the necessary corrections. Corrected shop drawings shall be resubmitted before fabrication of this work is complete to obtain a different action marking. Do not allow drawings marked "Resubmit" to be used in connection with installation of the Work.
4. "REJECTED/RESUBMIT" - General Contractor will be required to resubmit shop drawings in their entirety. No fabrication or installation shall be started until shop drawings so marked have been completely revised, resubmitted, and marked by Architect according to preceding Paragraphs a. or b.

N. Where resubmittal is required, 3 copies will be marked up and so noted of which the following distribution shall be made:

1. One (1) copy will be retained for Architect/Engineer's file.
2. Two (2) copies will be returned with corrections:
   a. One (1) copy for General Contractor
   b. One (1) copy for supplier/subcontractor

1.5 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information.
   a. Manufacturer's printed recommendations.
   b. Compliance with trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
   a. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
3. Submittals: Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Architect will retain one and will return the other marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
4. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

B. In compliance with the OSHA Hazard Communication Standard (1910.1200, 08-24-1987) Contractors shall post at the site MSDS (Material Safety Data Sheets) for ALL products classified as hazardous that their firm has knowledge that they will be furnishing, using, or storing on the jobsite during the duration of this Project in accordance with OSHA standards. At the completion of the project, the Contractor shall turn their "MSDS" information directly over to the Owner with a receipt for the Owner to sign. A copy of the signed receipt only shall be submitted to the Architect.

1.6 SAMPLES

A. The Contractor shall submit to the Architect triplicate samples to illustrate materials or workmanship, colors, and textures, and establish standards by which the Work will be judged.
   1. Submit full size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
      a. Mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Architect's sample. Include the following:
         1) Specification Section number and reference.
         2) Generic description of the sample.
         3) Sample source.
         4) Product name or name of the manufacturer.
         5) Compliance with recognized standards.
         6) Availability and delivery time.
      b. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
         1) Where variation in color, pattern, texture, and other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
         2) Refer to other Specification Sections for requirements for samples

that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

B. By approving and submitting samples, the Contractor thereby represents that he has determined and verified materials, catalog numbers, and similar data, and that he has checked and coordinated each sample with the requirements of the Work and of the Contract Documents prior to submitting to the Architect.

C. The Contractor shall resubmit the required number of correct or new samples until approved. The Contractor shall direct specific attention in writing or on resubmitted samples to revisions other than the changes requested by the Architect on previous submissions.

D. The Architect will review samples but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Architect's review of a separate item shall not indicate approval of an assembly in which the item functions.

E. The Architect's action shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents unless the Contractor has informed the Architect in writing of the deviation at the time of submission and the Architect has given written approval to the specific deviation, nor shall the Architect's action relieve the Contractor from responsibility for errors or omissions in the samples.

F. Unless otherwise specified, samples shall be in triplicate and of adequate size to show function, equality, type, color, range, finish, and texture of material. When requested full technical information and certified test data shall be supplied.

1. Each sample shall be labeled, bearing material name and quality, the Contractor's name, date, project name, and other pertinent data.
2. Transportation charges to and from the Architect's office must be prepaid on samples forwarded. Samples shall be retained by the Architect until the Work for which they were submitted has been accepted.

G. Materials shall not be ordered until final review is received in writing from the Architect. Materials shall be furnished, equal in every respect to reviewed samples. Where color or shade cannot be guaranteed, the maximum deviation shall be indicated by the manufacturer. Work shall be in accordance with the final reviewed samples.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

SAMPLE OF CONFIRMATION LETTER

(Type on Company Letterhead)

Date

Claren Architecture + Design, Inc.
6400 Congress Ave, Suite 2150
Boca Raton, Florida 33487

Re:
(Project Name)

(Specification Section No.)

Attn:

The undersigned does hereby certify that _____ manufactured by
(name of product)

_____ which is to be used on the above referenced project by (name of manufacturer)

_____ conforms to
(name of installer)

_____.
(list of standard, specification requirement or note marking)

Very truly yours,

Notary Stamp
and/or Seal

(Signature)

_____
(Title)

SECTION 01 35 16
ALTERATION PROJECT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Products and installation for patching and extending work
   2. Transition and adjustments
   3. Repair of damaged surfaces, finishes, and cleaning

PART 2 PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New Materials: As specified in product sections match existing products and work for patching and extending work.
B. Type and Quality of Existing Products: Determine by inspection and testing Products where necessary, referring to existing Work as a standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that demolition is complete, and areas are ready for installation of new Work.
B. Beginning of restoration Work means acceptance of existing conditions.

3.2 PREPARATION

A. Cut, move, or remove items as necessary for access to alterations and renovation Work.
   1. Replace and restore at completion.
B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete.
   1. Replace materials as specified for finished Work.
C. Remove debris and abandoned items from area and from concealed spaces.
D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
E. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity.
   1. Insulate ductwork and piping to prevent condensation in exposed areas.

3.3 INSTALLATION

A. Coordinate work of alternations and renovations to expedite completion and to accommodate Owner occupancy.
B. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original specified condition.
C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
D. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, electrical, and systems to full operational condition.
E. Re-cover and refinish work that exposed mechanical and electrical work exposed accidentally during the work.
F. Install products as specified in individual sections.

3.4 TRANSITIONS

A. Where new work abuts or aligns with existing, perform a smooth and even transition.
    1. Patched work to match existing adjacent work in texture and appearance
B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

3.5 ADJUSTMENTS

A. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
B. Where a change of plane of ¼" or more occurs, submit recommendation for providing a smooth transition for Architect review.
C. Trim existing doors as necessary to clear new floor finish and refinish trim as required.
D. Fit work at penetrations of surfaces as specified in Section 01 72 29.

3.6 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces damaged, lifted, discolored, or showing other imperfections.
B. Repair substrate prior to patching finish.

3.7 FINISHES

A. Finish surfaces as specified in individual product sections.
B. Finish patches to product uniform finish and texture over entire area.
    1. When finish cannot be matched, refinish entire surface to nearest intersections.

3.8 CLEANING

A. In addition to cleaning specified in Section 01 50 00, clean Owner occupied areas of work.

END OF SECTION

SECTION 01 40 00
QUALITY CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Quality assurance - control of installation
   2. Tolerances
   3. References and standards
   4. Mock-up
   5. Inspecting and testing laboratory services
   6. Manufacturers' field services

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
B. Comply fully with manufacturers' instructions, including each step in sequence.
C. If manufacturers' instructions conflict with contract documents, request clarification from Architect before proceeding, and document instructions or directions that may invalidate a warranty.
D. Comply with specified standards as a minimum quality for the work except when tolerances are more stringent by codes or specified requirements indicate higher standards or workmanship that is more precise.
E. Perform work by persons qualified to produce workmanship of specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
H. Contractor shall schedule work to prevent absorbent materials installation and/or concealment of areas until, the building is dried-in, the installation of permanent doors and windows to prevent development of mold, entrapment of mold, moisture inside concealed spaces, or moisture absorption into interior materials.

1.4 TOLERANCES:

A. Monitor fabrication and installation tolerance control of products to produce acceptable work; do not permit tolerances to accumulate.
B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with contract documents, request clarification from Architect before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

1.5 REFERENCES AND STANDARDS:

A. Workmanship shall comply with requirements of the standards specified by an association, trade, or other consensus standards of the specified products, except when the applicable code or the specifications requirements are more rigid.
B. Use current reference standard(s) based on the date of contract documents, except where a code establishes a specific date.
C. Obtain copies of standards where required by product specification sections.
D. The contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Architect shall be altered from the contract documents by mention or inference in any referenced document.

1.6 MOCK-UP:

A. Perform all tests identified in this section and in the respective product specification sections.
B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
C. Accepted mock-ups shall be a comparison standard for the remaining work.
D. Where Architect accepts the mock-up and product specification sections specify removal; remove mock-up and clear area when directed.

1.7 TESTING SERVICES:

A. Owner will appoint and pay for specified services of an independent firm to perform testing.
B. The independent firm will perform tests and other specified services as outlined in individual specification sections and as required by the Owner.
C. Testing and source quality control may occur on or off the project site.
    1. Perform off-site testing as required by the Architect or the Owner.
D. The independent firm shall submit reports to the Owner and Architect and Contractor, indicating observations and results of tests and compliance or non-compliance with contract documents.
E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
    1. Notify Owner, Architect and independent firm 2-business days minimum prior to expected time for operations requiring services.
    2. Make necessary arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
F. Testing does not relieve Contractor to perform work to contract requirements.
G. The Architect may direct the same independent firm to re-test because of non-conformance to specified requirements.
    1. Contractor shall pay for re-testing cost by deducting testing charges from the Contract Price.

1.8 INSPECTION SERVICES:

A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection.
B. The independent firm will perform inspections and other services specified in individual specification sections and as required by the Owner.
C. Inspecting may occur on or off the project site.
    1. Perform off-site inspecting as required by the Architect or the Owner.

D. The independent firm to the Owner and Architect and Contractor, indicating inspection observations and indicating compliance or non-compliance with contract documents, will submit reports.
E. Cooperate with independent firm; furnish safe access and assistance for incidental labor as requested.
   1. Notify Owner, Architect, and independent firm 2-business days minimum prior to expected time for operations requiring services.
F. Inspecting does not relieve Contractor to perform work to contract requirements.

1.8 MANUFACTURERS' FIELD SERVICES:

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
B. Submit qualifications of observer to the Architect 30 days in advance of required observations; the observer is subject to Owner's approval.
C. Report all observations, site decisions, and instructions given to the applicators or the installers that are supplemental or contrary to the manufacturers' written instructions.
D. Refer to Section 01 33 00 – Submittal Procedures.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work, beginning new work means acceptance of existing conditions.
B. Verify that existing substrate is capable of structural support or attachment of new work.
C. Examine and verify specific conditions described in individual specification sections.
D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION:

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 41 00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Compliance with all applicable regulatory requirements.

1.3 CODE REQUIREMENTS

A. Perform all work on this Project in strict accordance with, but not limited to, applicable requirements and portions of the latest editions of the currently adopted codes, revisions, amendments, and their references.
B. Florida Building Code:
   1. Florida Building Code – Building
   2. Florida Building Code – Fuel Gas
   3. Florida Building Code – Mechanical
   4. Florida Building Code – Plumbing
   5. National Electrical Code – FBC Chapter 27
   6. FBC Referenced Codes and Standards -- Chapter 35
C. Florida Fire Prevention Code, Ch. 69A-60, Florida Administrative Code, which includes:
   1. NFPA 1
   2. Referenced Mandatory Codes and Standards listed in 69A-60.005, FAC
   3. Referenced Mandatory Codes and Standards listed in NFPA 101
D. U.S. Access Board, Americans with Disabilities Act Architectural Guidelines, July 23, 2004, accessibility requirements for children
E. American Society of Civil Engineers - Minimum Design Loads for Buildings and Other Structures - ASCE 7
F. Florida Department of Education, State Requirements for Education Facilities (SREF)
G. State Fire Marshal's rule 69A-58 FAC

1.4 CODE STANDARDS

A. All work shall conform to applicable portions of the adopted, or the latest edition of the standards listed, which shall include, but is not limited to, the following:
   1. Aluminum Association (AA)
   2. American Concrete Institute (ACI)
   3. American Institute of Steel Construction (AISC)
   4. American National Standards Institute (ANSI)
   5. American Society for Testing and Materials (ASTM)
   6. American Society of Mechanical Engineers (ASME)
   7. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

8. American Welding Society (AWS)
9. Architectural Woodworking Institute (AWI)
10. Architectural Aluminum Manufacturer's Association (AAMA)
11. Commercial Standards (CS)
12. Federal Specifications and Standards (FSS)
13. National Occupations Safety and Health Administration (OSHA)
14. National Institute for Standards and Technology (NIST)
15. Architectural Sheet Metal Manual (SMACNA)
16. Underwriter's Laboratories (UL)
17. U.S. of America Standards Institute (ASI)
18. U.S. Department of Commerce Product Standards (USDCPS)

1.5 CODE DISCREPANCIES

A. In case of discrepancy between the codes, standards, and specifications listed, the most strict or most stringent requirement shall govern.

1.6 COMPLIANCE WITH CODES

A. A permit issued by the School District Building Department will be construed as permission to proceed with construction, and not as authority to violate, cancel, alter, or set aside any of the provisions of any Codes.
B. Nor shall issuance of a permit prevent the Building Official from thereafter requiring a correction of errors in plans, construction, or violations of any Codes.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

SECTION 01 45 00
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Selection and payment
   2. Quality Assurance
   3. Laboratory reports
   4. Limits on testing laboratory authority
   5. Contractor responsibilities

1.3 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
B. ANSI/ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.4 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing.
B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

A. Laboratory, authorized to operate in state of Florida.
B. Laboratory maintains a full time registered Engineer on staff to review services.
C. Testing Equipment, calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards (NBS) Standards or accepted values of natural physical constants.

1.6 LABORATORY REPORTS

A. After each inspection and test, submit 2-copies of laboratory report to Owner, Architect, and Contractor.
B. Include:
   1. Date issued
   2. Project title and number

3. Name of inspector
4. Date and time of sampling or inspection
5. Identification of product and Specifications Section
6. Location in the Project
7. Type of inspection or test
8. Date of test
9. Results of tests
10. Conformance with Contract Documents

C. When requested by Architect, provide interpretation of test results.

1.7 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
B. Laboratory may not approve or accept any portion of the Work.
C. Laboratory may not assume any duties of Contractor.
D. Laboratory has no authority to stop the Work.

1.8 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location, adequate samples of materials used, which require testing, along with proposed mix designs.
B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.
C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain, and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
D. Notify Owner, Architect, and laboratory 2-business days minimum prior to expected time for operations requiring inspection and testing services.
E. Arrange with laboratory and pay for additional samples and tests required by Contractor beyond specified requirements, and pay compensation for Architect's additional services made necessary by failed tests and inspections.
F. Testing and reports by the Contractor shall conform to the requirements of this section.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. The Work of this Section shall be included as a part of the Contract Documents of the Contractor on this Project. The Contractor shall provide such temporary facilities as specified and as indicated on the Drawings.

B. The Contractor responsible for installing and maintaining such temporary facilities shall remove from the premises temporary work erected by him at the completion of the Project, or when requested to do so by the Architect. Temporary structures and facilities become the property of the party furnishing them. Leave premises clean and in acceptable conditions as approved by the Architect.

C. Temporary facilities include, but are not limited to, the following:

1. Temporary utilities include, but are not limited to, the following:
    a. Water service and distribution
    b. Temporary electric power and light
    c. Ventilation
    d. Telephone service
    e. Sanitary facilities, including drinking water
    f. Storm and sanitary sewer
2. Support facilities include, but are not limited to, the following:
    a. Field offices and storage sheds
    b. Temporary roads and paving
    c. Waste disposal services
    d. Temporary enclosures
    e. Moisture and sediment control
    f. Temporary project identification signs
    g. Openings for electrical, mechanical, and other trades
    h. Temporary first aid facilities
3. Security and protection facilities include, but are not limited to, the following:
    a. Temporary fire protection
    b. Safety and health regulations for construction
    c. Environmental protection
    d. Security enclosure
    e. Utility protection

D. Temporary facilities must meet all applicable governing codes.

1.3 DIVISION OF RESPONSIBILITIES

A. Contractor is responsible for the following, unless noted otherwise:

1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office complete with necessary furniture, utilities, and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary ventilation, humidity control, and enclosure of the building where these facilities are necessary for its construction activity but have not yet been installed by the responsible prime contractor.
6. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
7. Secure lockup of its own tools, materials, and equipment.
8. Construction aids and miscellaneous service and facilities necessary exclusively for its own construction activities.
9. Collection and disposal of own wastes, unless noted as responsibility of Contractor.
10. Own temporary telephone.
11. Barricades, warning signs, and lights.
12. Environmental protection.

B. The Contractor is responsible for the following:
1. General temporary telephone service.
2. Temporary field offices for the Architect and the Owner.
3. Temporary roads and paving.
4. Temporary toilets, including disposable supplies.
5. Containerized bottled water drinking water units.
6. Temporary enclosure of the building.
7. Project identification and temporary signs.
8. General collection and disposal of wastes.
9. Enclosure fence.
10. Security enclosure and lockup.

C. The Contractor is responsible for the following:
1. Piped temporary water service.
2. Temporary gas service.
3. Temporary sewers and drainage.
4. Temporary toilet fixtures.
5. Temporary wash facilities.
6. Temporary drinking fountains.
7. Dewatering facilities and drains.
8. Temporary fire hoses and signs.

D. The Contractor is responsible for the following:
1. Temporary ventilation, upon enclosure of the building.

E. The Contractor is responsible for the following:
1. Temporary electric power service and distribution.
2. Temporary lighting.
3. Power lines and outlets for temporary electric water coolers.
4. Connections for illuminated signs.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
   1. Building code requirements
   2. Health and safety regulations
   3. Utility company regulations
   4. Police, fire department, and rescue squad rules
   5. Environmental protection regulations

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alternations, and Demolition Operations", ANSI A10 Series Standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities".
   1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code".

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

B. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Section 06 10 00 - Rough Carpentry.

C. Paint: Comply with requirements of Sections 09 91 13 – Exterior Painting and 09 91 23 – Interior Painting.

D. Tarpaulins: Provide waterproof, fire resistant, UL labeled tarpaulins with flame spread rating of 15 or less. For temporary enclosures, provide translucent, nylon reinforced, laminated polyethylene or polyvinyl chloride, fire retardant tarpaulins.

E. Water: Provide potable water approved by local health authorities.

F. Open Mesh Fencing: Provide 0.120 inch thick, galvanized 2 inch chain link fabric fencing 6 feet high with galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
B. Water Hoses: Provide 3/4 inch, heavy duty, abrasion resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
C. Electrical Outlets: Provide properly configured, NEMA polarized outlets to prevent insertion of 110 to 120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
D. Electrical Power Cords: Provide grounded extension cords. Use hard service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length voltage ratio.
E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
F. Temporary Offices: Provide prefabricated or mobile units or similar job built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.
G. Fire Extinguishers: Provide hand carried, portable, UL rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand carried, portable, UL rated, Class ABC, dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposures.
    1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
B. Provide each facility ready for use where needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
    1. Arrange with company and existing users for a time when service can be interrupted.
    2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked in services.

3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

B. Water Service Distribution
1. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
   a. The Contractor shall provide a minimum of 2 hose bibbs with vacuum breakers at each temporary tap. Distribution piping shall be sized to provide sufficient pressure at outlet of 100 foot hose attached to hose bibb. The Contractor shall maintain and service temporary water supply. This shall include, but not be limited to, replacement and repair of damaged pipe and equipment due to freezing or other causes.
   b. The Contractor shall provide own means of conveying water from temporary water taps to work.
   c. Sterilization: Sterilize temporary water piping prior to use.
   d. The Owner will pay for metered water only. Bottled or trucked in water shall be the expense of the Contractor.
   e. The Contractor shall pay water service use charges where metered or otherwise, for water used by all entities engaged in construction activities at the project site.

C. Temporary Electric Power and Light
1. The Contractor shall provide, maintain, and connect the temporary electric service for temporary lighting and power tool usage during the construction and shall include service pole, main disconnect means, wiring, and distribution equipment.
   a. Temporary service shall be separately metered and shall be 115/230 volt, single-phase, 3 wire plus ground, of sufficient capacity but not less than 200 ampere.
   b. Electrical subcontractor shall provide the following temporary lighting and power distribution system for this project.
      Provide 6 circuit load center panel with main disconnect and with a minimum of six 20 ampere receptacles (one per circuit) at the point of service.
      1) Provide 60 ampere, 3 wire plus ground circuit with appropriate outlets at the point of service for miscellaneous power taps.
      2) Provide lighting outlets, protected by 20 ampere circuits. Outlets shall be lamped with not less than 200 watt incandescent lamps.
      3) Extend temporary wiring for lighting into rooms upon the request for lighting of work spaces.
      4) Circuits and/or feeders shall be protected by appropriately rated ground fault detection and interruption devices.
   c. Lamps for temporary lighting shall be provided and maintained by the Contractor at his expense. Every temporary lamp outlet must be properly lamped throughout construction; dark or burned out lamps shall be immediately replaced.
   d. Upon approval of use and completion of the changeover to the permanent electrical system, the Contractor shall remove portions of the temporary electrical service, including power and lighting distribution and/or utilization

equipment and wiring.

3. All temporary power to construct the facility will be at the Contractors expense until such time that the Owner takes beneficial occupancy (acceptance of substantial completion).

D. Ventilation/Air Conditioning

1. The Contractor shall provide for ventilation and air conditioning of enclosed space for workman in accordance with applicable laws. Contractor shall also provide ventilation and air conditioning of the enclosed space as required to facilitate drying in accordance with manufacturer's directions and as required to attain proper moisture levels within building including materials, surfaces and ambient air for installation and application of interior materials and equipment.
2. If the permanent ventilation and air conditioning system is used, the HVAC Contractor shall assume full responsibility for maintenance of the permanent equipment and shall keep the system clean, furnish and change filters as needed, and turn the complete new heating-ventilation system over to the Owner in a clean condition when the project is completed. Permanent equipment shall not be used for temporary ventilation unless maintained and operated as follows:
   a. Return air ducts shall not be used.
   b. Supply air to each unit shall be filtered.
   c. Filters shall be constantly checked and changed when necessary.
   d. Operation of permanent equipment for ventilation shall not negate the Owner's one year warranty specified to commence on the date of Substantial Completion.

E. Temporary Telephones

1. The Contractor shall provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for the temporary office. Use of Cellular mobile phone system is acceptable, if phone can be maintained.
   a. Provide a dedicated telephone line for a fax machine in the field office.
   b. At each telephone, post a list of important telephone numbers.
   c. Subcontractors shall provide their own telephones if required by them or, if acceptable to the Contractor, coordinated shared use of main phone.

F. Sanitary Facilities

1. The Contractor shall provide, at the beginning of Work, and shall maintain temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.
   a. Toilets: Install self contained toilet units. Shield toilets to ensure privacy. Use of pit type privies will not be permitted.
      1) Provide separate facilities for male and female personnel.
   b. Drinking Water Facilities: Provide one of the following:
      1) Containerized, tap dispenser, bottled water drinking water units, including paper supply.

G. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar

contaminants that might clog sewers or pollute waterways before discharge.

2. Connect temporary sewers to the municipal system, where applicable, as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.
4. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

A. Field Offices and Storage Sheds

1. The Contractor shall provide and maintain during the construction of the Project, adequate construction office facility at the site for office personnel at site and small progress meeting, approximately 10 foot by 30 foot, for use by Architect and Owner.
   a. Provide adequate and dedicated work space for Architect's field representative.
2. Services required shall include light, heat, approved toilet facilities, janitor service, telephone, closets, drawing and reference tables, drawing racks, two desks, and four chairs.
3. Maintain files, racks, bins, and shelves for shop drawings, Drawings and Specifications, and for similar documents required by Contractors performing Work on the Project.
4. Provide mud free walks for access to offices and from the offices to a point of general access to the building or buildings.
5. Mobile offices or storage facilities may also be supplied by subcontractors for their use under the same conditions, if approved by the Owner/Architect. Remove from and clean premises when directed by Owner.
   a. Temporary utilities, electrical service, and telephone service shall be provided by each Contractor and subcontractor for their respective construction trailers, offices, work areas, etc., and shall be located at the discretion of the Owner in accordance with the project use site plan.
   b. As required by the Contractor, due to construction requirements, moving and relocating of trailers and offices will be the responsibility of the Contractor or subcontractor involved, including costs associated therewith.
6. The Contractor and subcontractors shall provide storage sheds as required for own use, if approved by the Owner. Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere onsite.
7. No signs will be allowed to be erected on the site or on the building unless approved by the Owner.

B. Temporary Roads and Paving

1. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.
   a. Paving: Comply with Section 32 12 16 – Final Asphaltic Concrete Surfacing

for construction and maintenance of temporary paving.

b. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.

c. Install temporary paving to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.

d. Delay installation of final course of permanent asphalt concrete paving until immediately before substitution completion. Coordinate with weather conditions to avoid unsatisfactory results.

e. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

C. Waste Disposal Services

1. Contractor shall provide (for the life of the Project) and pay for dumpster type rubbish container adequately sized for the waste, debris, and rubbish generated.

a. Contractor shall dispose of container contents weekly or at more frequent intervals if required by inadequate container capacity.

b. Shall erect suitable, closed, relatively dust free chutes for the use by all trades during demolition and remodeling. No material or debris will be permitted to drop free.

2. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

D. Temporary Enclosures

1. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

a. Where ventilation is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

b. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

1) Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL labeled, fire retardant treated material for framing and main sheathing.

c. Close openings through floor or roof decks and horizontal surfaces with load bearing, wood framed construction.

2. Maintain required exitways for protection of life and property.

a. Temporary enclosures shown on the Drawings and additional enclosures, if necessary for the proper execution of the Work shall be provided by the General Trades Contractor, cost to be included in the Contractor's Base Bid.

E. Moisture and Sediment Control
1. Contractor shall furnish necessary equipment, take necessary precautions, and assume the entire cost of sediment control, also handling and properly disposing of sewerage, seepage, storm; surface, floor, and underground; water, and waterflows which may be encountered during the construction of his Work. The manner of providing sediment control and handling of water or waterflows shall meet with the approval of the Owner, and the entire cost of Work shall be included in the Base Bid of Work to be done under each Contract.

F. Openings for Electrical, Mechanical, and Other Trades
1. Temporary openings not called for on the Drawings, which may be required for the purpose of bringing equipment into the buildings or for placing same, shall be performed as reviewed by the Architect. The Contractor shall perform the Work of providing and maintaining such openings and of restoring the structure.
2. The Contractor whose equipment or work requires temporary openings is to bear the cost involved in providing such openings and restoring the structure. Ample notice shall be given of size and location of such openings by the Contractor requiring same.
3. Holes provided in general construction work to permit installation of lines for temporary mechanical and electrical services shall be restored by the Contractor doing the affected construction work, after removal of such lines, at no extra cost.

G. Temporary First Aid Facilities
1. Contractor and subcontractor shall provide first aid facilities as required by Federal, State, or Local Safety Regulations.

3.4 SECURITY AND PROTECTION FACILITIES

A. Temporary Fire Protection
1. The Contractor shall provide, maintain, and have readily accessible, approved type extinguishers when working adjacent to hazardous areas such as painting and welding, or when using torches or open flames for heating or cutting. Personnel working on the Project shall be familiarized with the locations and operation of fire extinguishers.
2. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations.”
   a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
   b. Store combustible materials in containers in fire safe locations.
   c. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
   d. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
3. Permanent Fire Protection: At the earliest feasible date in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

B. Safety and Health Regulations for Construction
   1. These Construction Documents and the construction hereby contemplated shall be governed by applicable provisions of Federal, State and local regulations for construction safety in the State in which the project is located.
      a. Contractor shall be responsible for the safety and health of persons and property affected by the Contractor's performance of the Work including work performed by his subcontractors. This requirement shall apply continuously during the entire contract period and shall not be limited to normal working hours.
      b. Contractor shall designate a qualified safety and health representative to be responsible for the administration of the Contractor's Safety and Health program.
   2. Contractor shall be responsible for compliance with the above aforesaid safety and health regulations for construction as applicable to the Contractor's Contract and the Contractor's construction means and methods. Contractor shall be liable for violations as may be cited or charged against the Contractor by authorities governing the safety and health regulations for construction.
      a. The Architect and the Owner shall not be responsible for construction means and methods and shall not be responsible for construction safety. The Contractor shall indemnify and hold harmless the Architect and Owner.
   3. Barricades
      a. Contractor shall provide and pay for temporary construction barricades as required for safety and security for his specified portion of the Work.
      b. Erect barricades as required by applicable laws at slab edges, slab openings, and other building hazards.
      c. Painted with appropriate colors, graphics, and warning signs to inform personnel and the public of hazard being protected against.
         1) Barricades shall be erected prior to placing of concrete slabs.
         2) Remove and legally dispose of barricades when directed.
   4. Where appropriate and needed, provide lighting, including flashing red or amber lights.

C. Environmental Protection
   1. In order to prevent and to provide for abatement and control of environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this Contract, they shall comply with applicable federal, state, and local laws, and regulations concerning environmental pollution control and abatement as well as the specific requirements stated elsewhere in the Contract Documents.
   2. Items having apparent historical or archaeological interest which are discovered in the course of construction activities shall be carefully preserved. The Contractor shall leave the archaeological find undisturbed and shall immediately report the find to the Architect so that the proper authorities may be notified.
   3. No Contractor shall pollute water resources with fuels, oils, bitumens, calcium chloride, acids or harmful materials. It is the responsibility of each Contractor to investigate and comply with applicable federal, state, county, and municipal laws concerning pollution of rivers and streams. Work under this Contract shall be performed in such a manner that objectionable conditions will not be created in water resources through or adjacent to the project areas.

a. Spillages: Throughout the deviation of the Project, special measures shall be taken to prevent chemicals, fuels, oils, grease, bituminous materials, waste washings, herbicides and insecticides, and cement from entering water resources.

b. Disposal: If waste material is dumped in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed by the Architect, and replaced with suitable fill material, compacted and finished with topsoil, at the expense of the Contractor.

4. Contractor will be required to minimize dispersed dust at required excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and other work areas on or off site to minimize dispersed dust.

D. Security Enclosure and Lockup

1. Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

a. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of materials to minimize the opportunity for theft and vandalism.

2. The Contractor shall provide temporary doors and closures, cost to be included in the Contractor's Base Bid.

3. Provide hinged plywood or barren doors with locks to maintain temperatures necessary to perform the Work and provide temporary building security.

4. Permanent closures of openings may be installed, provided that these are protected and are left in perfect condition when building is completed. Where required, closures shall be of a material or type which will permit passage of air for ventilation to dry out building.

5. Relocate as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of Owner and other Contractors employed at the site. Completely remove when construction needs can be met by use of permanent construction. Clean and repair damage caused by installation or by use.

E. Utility Protection

1. Existing utility lines and structures indicated or known, and utility lines constructed for this Project shall be protected from damage during construction operations.

2. Locate and flag lines and structures before beginning excavation and other construction operations.

3. When utility lines and structures that are to be removed or relocated are encountered within the area of operations, notify the Contractor and affected utility in ample time for the necessary measures to be taken to prevent interruption of the services.

4. Damage to existing utility lines or structures not indicated or known shall be reported immediately to the Contractor and the affected utility.

END OF SECTION

SECTION 01 56 00
SECURITY BARRIERS & ENCLOSURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Security Program
   2. Entry Control
   3. Personnel Identification

1.3 SECURITY PROGRAM

A. Protect work, existing premises, and Owner's operations from theft, vandalism, and unauthorized entry.
B. Initiate program in coordination with Owner's existing security system at project mobilization.
C. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.
D. Provide security barrier between new construction and the existing building to provide security to existing building interior spaces.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.
B. Allow entrance only to authorized persons with proper identification.
C. Maintain log of workers and visitors, make available to Owner on request.
D. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

1.5 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.
B. Maintain a list of accredited persons; submit copy to Owner on request.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 57 00
TEMPORARY CONTROLS

PART 1GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Temporary Controls
   2. Dust Control
   3. Erosion and Sediment Control
   4. Noise Control
   5. Pest Control
   6. Pollution Control
   7. Rodent Control
   8. Environmental (temperature, relative humidity) Control

1.3 DUST CONTROL

A. Employ any and all specified controls required to protect Owner's existing property and facilities.
B. Execute work by methods to minimize raising dust from construction operations.
C. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
D. Provide means to control dust and debris from entering the public streets and rights of way.

1.4 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
B. Minimize amount of bare soil exposed at one time.
C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
F. Do not allow mud or debris-laden runoff to enter existing storm water system.
G. Comply with Florida DEP National Pollutant Discharge Elimination System requirements.

1.5 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise from and noise produced by construction operations.

1.6 PEST CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.7 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.8 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.8 ENVIRONMENTAL CONTROL

A. Maintain temperature in accordance with Section 01 50 00.
B. Maintain relative humidity in accordance with Section 01 50 00.
C. Contractor is responsible for environmental control until the District accepts the facility with the Certificate of Occupancy (CO) or the Temporary Certificate of Occupancy (TCO).
    a. Contractor is responsible for any damage caused by the formation of mold and mildew or other deterioration of any building materials prior to CO or TCO.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
   1. Product standards and quality – substitutions
   2. Substitutions
   3. Manufacturer's directions
   4. Warranties
   5. Material delivery and responsibilities
   6. Protection
   7. Acceptance of equipment or systems

B. It is the intent of the Specifications and Drawings to accomplish a complete and first-grade installation executed by competent and experienced workmen.

C. Equipment, specialties, and similar items shall be checked for compliance and fully approved prior to installation. The Contractor is cautioned that work or equipment installed without approval is subject to condemnation and removal, with subsequent replacement with an approved item without extra remuneration.

D. Related Work Specified Elsewhere
   1. Section 01 33 00 - Submittal Procedures

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finishes,” “accessories,” and similar terms. Such terms are self explanatory and have well recognized meanings in the construction industry.
   1. “Products” are items purchased for incorporation in the Work, whether purchased for the project or taken from previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of similar intent.
   2. “Named Products” are items identified by the manufacturer’s product name, including make or model number or other designation, shown or listed in the manufacturer’s published product literature that is current as of the date of the Contract Documents.

B. “Materials” are products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work.

C. “Equipments” is a product with operational parts, whether motorized or manually operated, that require service connections, such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. The prime contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long term storage at the site and to prevent over crowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products of the site in a manner that will facilitate inspection and measurement of quality or counting of units.
6. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS AND QUALITY - SUBSTITUTIONS

A. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

B. Where in the Drawings and Specifications certain products, manufacturer's trade names, or catalog numbers are given, it is done for the expressed purpose of establishing a basis of quality, durability, and efficiency of design in harmony with the work outlined and is not intended for the purpose of limiting competition.

C. The Architect will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Architect to evaluate the proposed substitution.

D. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the Architect.

E. "Or equal":

1. Where the phrase "or equal" or "or equal as approved by the Architect" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the Architect unless the item has been specifically approved for this Work by the Architect in an Addendum.
2. The decision of the Architect shall be final.

F. Availability of Specified Items
1. Verify prior to bidding that specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified item or items will not be so available, so notify the Architect prior to receipt of bids.
3. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back charged as necessary and shall not be borne by the Owner.

G. Where the questions of appearance, artistic effect, or harmony of design are concerned, the Architect reserves the right to refuse approval of substituted products proposed to be substituted for that specified, if in his opinion the item to be substituted is not harmonious to the finished effect and appearance desired, as portrayed in the Drawings and Specifications. The Architect's said refusal to approve, established by this paragraph, is final.

2.2 SUBSTITUTIONS

A. Substitutions: Changes in products, materials of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests of substitutions. The following are not considered to be requests for substitutions.
1. Substitutions requested during the bidding period, accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor’s determination of and compliance with governing regulations and orders issued by governing authorities.

B. Conditions: The Architect will receive and consider the Contractor’s request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements:
1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner’s additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
6. The specified product or method of construction cannot receive necessary approval

by a governing authority, and the requested substitution can be approved.

7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
8. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitutions provide the required warranty.

C. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for Architect's approval and complete technical data for evaluation must be received at least 14 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.3 MANUFACTURER'S DIRECTIONS

A. Manufactured products shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's printed directions, unless herein specified to the contrary. Where manufacturer's printed directions are available and where reference is made to manufacturer's directions in the Specifications, the Contractor shall submit 2 copies of such directions to the Architect prior to the beginning of any Work covered thereby.

B. Where specific installation instructions are not part of these Specifications and Drawings, equipment shall be installed in strict accordance with instructions from the respective manufacturers. Where installation instructions included in these Specifications or Drawings are at a variance with instructions furnished by the equipment manufacturer, the Contractor shall make written request for clarification from the Architect.

C. In accepting or assenting to the use of an apparatus or material, or make, or arrangement thereof, the Architect in no way waives any of the requirements of these Specifications or the warranty embodied therein.

2.4 WARRANTIES

A. Specific warranties or bonds called for in the Contract Documents, in addition to that falling under the general warranty as set forth in General Conditions, shall be furnished in accordance with the requirements of the Specifications.

1. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
2. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

B. The Contractor shall and does hereby agree to warrant for a period of one year, or for longer periods, where so provided in the Specifications, as evidenced by the date of Substantial Completion issued by the Architect, all products installed under the Contract to be of good quality in every respect and to remain so for periods described herein.

C. Should defects develop in the aforesaid Work within the specified periods, due to faults in

products or their workmanship, the Contractor hereby agrees to make repairs and do necessary Work to correct defective Work to the Architect's satisfaction. Such repairs and corrective Work, including costs of making good other Work damaged by or otherwise affected by making repairs or corrective Work, shall be done without cost to the Owner and at the entire cost and expense of the Contractor within 14 days after written notice to the Contractor by the Owner.

1. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Nothing herein intends or implies that the warranty shall apply to Work which has been abused or neglected or improperly maintained by the Owner or his successor in interest.

E. Where service on products is required under this Article, it shall be promptly provided when notified by the Owner and no additional charge shall be made, unless it can be established that the defect or malfunctioning was caused by abuse or accidental damage not to be expected under conditions of ordinary wear and tear.

F. The manufacturer and supplier expressly warrants that each item of equipment furnished by him and installed in this Project is suitable for the application shown and specified in the Contract Documents and includes features, accessories, and performing characteristics listed in the manufacturer's catalog in force on the date bids are requested for the Work. This warranty is intended as an assurance by the manufacturer that his equipment is not being misapplied and is fit and sufficient for the service intended. This warranty is in addition to and not in limitation of any other warranty or remedy required by law or by the Contract Documents. It shall be the responsibility of the Contractor for the particular equipment to obtain this warranty in writing.

G. In case the Contractor fails to do Work so ordered, the Owner may have work done and charge the cost thereof against monies retained as provided for in the Agreement and, if said retained monies shall be insufficient to pay such cost or if no money is available, the Contractor and his Sureties shall agree to pay to the Owner the cost of such Work.

2.5 MATERIAL DELIVERY AND RESPONSIBILITIES

A. The Contractor shall be responsible for materials he orders for delivery to the jobsite. Responsibility includes, but is not limited to, receiving, unloading, storing, protecting, and setting in place; ready for final connections.

1. The Owner will not be responsible for deliveries related to the construction or operation of the Contractor. The Owner cannot sign delivery forms for the Contractor.

B. Contractor shall insure that products are delivered to the Project in accordance with the Construction Schedule of the Project. In determining date of delivery, sufficient time shall be allowed for shop drawings and sample approvals, including the possibility of having to resubmit improperly prepared submittals or products other than those specified and the necessary fabrication or procurement time along with the delivery method and distance involved.

2.6 PROTECTION

A. The Contractor shall protect building elements and products subject to damage. Should workmen or other persons employed or commissioned by the Contractor be responsible for damage, the entire cost of repairing said damage shall be assumed by said Contractor. Should damage be done by a person or persons not employed or commissioned by the Contractor, the Contractor shall make repairs and charge the cost to the guilty person or persons. The Contractor shall be responsible for collecting such charges.

B. The Contractor shall protect products prior to installation and final acceptance. Storage shall be dry, clean, and safe. Materials or equipment damaged, deteriorated, rusted, or defaced due to improper storage, shall be fully repaired, refinished, or replaced, as required by the Architect. Products lost through theft or mishandling shall be replaced by the Contractor without cost to the Owner.

2.7 ACCEPTANCE OF EQUIPMENT OR SYSTEMS

A. The Owner will not accept the start of the warranty period on systems or equipment until Substantial Completion is issued to the Contractor for Owner's occupancy of the building, in part or whole. The Contractor shall make such provisions as required to extend the manufacturer's warranty from time of initial operation of systems or equipment until Substantial Completion is given in writing.

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

SECTION 01 72 29
CUTTING AND PATCHING

PART 1GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. The requirements and limitations for the cutting and patching of work.

1.3 SUBMITTALS

A. Submit written request in advance of cutting or alteration, which affects:
   1. The structural integrity of any element of project
   2. The integrity of weather exposed or moisture resistant element
   3. The efficiency, maintenance, or safety of any operational element
   4. Visual qualities of sight exposed elements
   5. Work of Owner or separate contractor

B. Include in request:
   1. The identification of project
   2. The location and description of affected work
   3. The necessity for cutting or alteration
   4. A description of proposed work, and products
   5. Any possible alternatives to cutting and patching
   6. Any effect on work of Owner or separate contractor
   7. Written permission from affected separate contractor(s)
   8. Proposed date and time the work starts

PART 2 PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.
B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching.
C. After uncovering existing work, assess conditions affecting performance of work.

D. The contractor beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the work.
   1. Provide devices and methods to protect other portions of project from damage.
B. Provide protection from elements for areas, which may be exposed by uncovering work.
C. Maintain excavations free of water.

3.3 CUTTING

A. Execute cutting and fitting including excavation and fill to complete work.
B. Uncover work to install improperly sequenced work.
C. Remove and replace defective or non-conforming work.
D. Remove samples of installed work for testing when requested.
E. Provide openings in the work for penetration of mechanical and electrical work.
F. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.
G. Cut rigid materials using masonry saw or core drill.
   1. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

A. Execute patching to complement adjacent work.
B. Properly fit products together to integrate with other work.
C. Execute work by methods to avoid damage to other work and which, provide appropriate surfaces to receive patching and finishing.
D. Employ original installer to perform cutting and patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
E. Restore work with new products in accordance with requirements of Contract Documents.
F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.
H. Refinish surfaces to match adjacent finish.
   1. For continuous surfaces, refinish to nearest intersection or natural break.
   2. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 23
CONSTRUCTION CLEANING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. The Architect reserves the right to act on behalf of the Owner pertaining to the clean-up responsibilities that are a part of the Contractor's Work.
B. Related Work Specified Elsewhere
   1. Section 01 77 00 - Closeout Procedures.
   2. Special cleaning requirements for specific construction elements are included in appropriate sections of Divisions 2 through 34.

1.3 PURPOSE - DAILY CLEANING

A. Define and emphasize the responsibility of the Contractor to remove his rubbish and debris from the construction site to guard against fire and safety hazards as well as to provide a more efficient construction operation for all Contractors. If this cleaning is not performed to the satisfaction of the Owner and the Architect, it will be performed for the Contractor at his expense, cost of which will be deducted by Change Order prior to final payment.

1.4 PURPOSE - ROUTINE CLEANING

A. Each Friday afternoon, and more often if necessary, the Contractor shall perform an overall clean-up of the entire site, including a broom cleaning of appropriate surfaces. The trades shall remove their rubbish and debris from the building site to the rubbish collection location promptly upon its accumulation and in no event later than the Contractor's regular Friday general clean-up.

1.5 RUBBISH CONTAINMENT

A. Refer to Section 01 50 00 - Temporary Facilities and Controls for requirements.

1.6 SAFETY REQUIREMENTS

A. Hazards Control
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.
B. Conduct cleaning and disposal operations to comply with local ordinances and anti-

pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
   1. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finish surface.
B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.1 DAILY CLEANING

A. Contractor shall execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
C. Daily, during progress of work, clean site and public properties and dispose of waste materials, debris, and rubbish in dumpster type rubbish container provided under this Section.
D. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
E. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
F. Place no new work on dirty surfaces.

3.2 ROUTINE CLEANING

A. Employ experienced workmen for cleaning.
B. Remove dirt, mud, and other foreign materials from sight exposed interior and exterior surfaces.
C. Weekly, or at more frequent intervals, if work activities justify same, perform the following cleaning. This includes all dirt, dust, and debris not identifiable as part of a Contract. Broom clean floor and paved surfaces; rake clean other surfaces of ground.
D. Maintain cleaning throughout the duration of the Project.

3.3 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Contractor shall perform his respective final clean-up and shall leave the Work of the completed Project in clean, neat condition.

C. The following are examples, but not by way of limitation, of cleaning levels required:
   1. Remove labels which are not required as permanent labels.
   2. Clean transparent materials, including mirrors and window/door glass to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.
   3. Clean exposed exterior and interior hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films, and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
   4. Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.
   5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   6. Clean concrete floors in unoccupied spaces broom clean.
   7. Vacuum clean carpeted surfaces and similar soft surfaces.
   8. Clean plumbing fixtures to a sanitary condition, free of stains, including those resulting from water exposure.
   9. Clean light fixtures and lamps so as to function with full efficiency.
   10. Clean project site (yard and grounds), including landscape development areas of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills, and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth, even textured surface.
   11. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even textured surface.
   12. Remove petrochemical spills, stains, and other foreign deposits.
   13. Remove tools, construction equipment, machinery, and surplus material from the site.

D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.

END OF SECTION

SECTION 01 75 00
STARTING and ADJUSTING SYSTEMS

PART 1GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Starting systems
   2. Demonstration and instructions
   3. Testing, adjusting, and balancing

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Architect and Owner seven days prior to startup of each item.
C. Verify each piece of equipment or system for proper lubrication, drive rotation, belt tension, control sequence, or other conditions that may cause damage.
D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify wiring and support components for equipment are complete and tested.
F. Execute startup under supervision of responsible Contractors' personnel in accordance with manufacturers' instructions.
G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to startup, and to supervise placing equipment or system in operation.
H. Submit a written report, per section 01 40 00, verifying the proper installation of the equipment or system and that it functions correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.
B. Demonstrate Project equipment instructed by a qualified manufacturers' representative knowledgeable about the Project.
C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.
F. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

1.5 TESTING, ADJUSTING, AND BALANCING

A. Owner will appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balancing.
B. The independent firm shall submit reports to the Architect indicating observations, results of tests and compliance or non-compliance with specified requirements and with the requirements of the contract documents.
C. The independent firm shall coordinate scheduling of Testing, Adjusting, and Balancing activities with the General Contractor.
   1. Testing, Adjusting and Balancing must be completed prior to scheduling equipment and system Functional Performance Testing.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 Contractor shall coordinate equipment and system start-up with the Owner and Architect.

A. This is to include in-progress inspections required by the Mechanical Engineer.

END OF SECTION

SECTION 01 77 00
CONTRACT CLOSEOUT

PART 1GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Closeout procedures
   2. Final cleaning
   3. Adjusting
   4. Project record documents
   5. As-built survey
   6. Operation and maintenance data
   7. Spare parts and maintenance Products
   8. Warranties and bonds
   9. Maintenance service

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that contract documents were reviewed, work inspected, and that work is complete in accordance with contract documents and ready for Owner and Architect review.
   1. The written certification shall include documentation verifying all required Functional Performance Test Procedures were successfully completed and that all issues are resolved.
B. Provide submittals to Architect and Owner that are required by governing or other authorities.
C. Submit final application for payment identifying total adjusted contract sum, previous payments, and sum remaining due.
D. Owner will have the option to occupy all or portions of the facility.

1.4 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate for he surface and material.
D. Replace filters of operating equipment.
E. Clean debris from roofs, gutters, downspouts, and drainage systems.
F. Clean site; sweep paved areas, rake clean landscaped surfaces.
G. Remove waste and surplus materials, rubbish, and construction facilities from the site.
H. Clean and sanitize water fountains (coolers).
I. Clean all ledges countertops and shelves with all-purpose non-abrasive cleaner leaving no residue.

1.5 ADJUSTING

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

1.6 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the work:
   1. Drawings/specifications, RFIs, and addenda
   2. Change orders and other modifications to the contract
   3. Reviewed shop drawings, product data, and samples
   4. Manufacturer's instruction for assembly, installation, and adjusting
B. Ensure entries are complete and accurate, enabling future reference by Owner.
C. Store record documents separate from documents used for construction.
D. Record information related to changes of approved construction documents concurrent with construction progress.
E. Specifications - legibly mark and record at each product section a description of the products installed.
   1. Manufacturer's name, product name and model number
   2. Product substitutions or alternates utilized
   3. Changes made by addenda and modifications
F. Record drawings and shop drawings - legibly mark each item to record actual construction.
   1. Measured depths of foundations in relation to finish first floor datum
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   4. Field changes of dimension and detail.
   5. Provide any additional details not on original contract drawings.
G. As-built survey/Flood Certification Form:
   1. Upon completion of site construction improvements, provide Architect and Owner with a complete and accurate field survey prepared, signed and sealed by a Florida registered surveyor.
      a. Exact horizontal and vertical location relative to property lines and NGVD of buildings, concrete and asphalt surfaces and all drainage features including lakes, detention areas, berms, embankments and swales.
      b. Show the actual grades of the spot elevations shown on the paving and drainage plans.
      c. Provide sufficient information indicating a true representation of constructed grade conditions for areas where grading between two elevation points is not constructed at a uniform slope.
      d. Survey shall include cross sections elevations at 50' stations of swales, lakes, and drainage retention areas including banks, berms, bottoms, and transitions constructed or improved.
      e. Elevations shown shall be accurate to the nearest tenth of a foot.
   2. Upon completion of site construction improvements, provide Architect, District Building Department, and Owner with a complete and accurate FEMA Flood Certification form (FEMA 81-31) prepared, signed and sealed by a Florida registered surveyor.
H. Submit documents, AutoCAD (12, 13, 14, or 2000) files, and TIFF files on a CD to Architect and Owner, prior to claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

A. See Section 01 78 23 for requirements.

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products in quantities specified in specification.
B. Provide copies of all itemized receipts/transmittals listing the extra materials or parts with their physical location indicated prior to final payment.

1.9 WARRANTIES AND BONDS

A. Provide duplicate notarized copies.
B. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.
C. Provide Table of Contents and assemble in D-side 3-ring binder with durable plastic cover.
D. Provide one paper copy and two CD's or DVD copies.
E. Submit prior to final application for payment.
F. For items of work delayed beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections for one-year from date of substantial completion.
B. Examine, clean, adjust, and lubricate system components as required for reliable operation.
C. Include systematic examination, adjustment, and lubrication of components repairing or replacing parts as required with parts produced by the manufacturer of the original component.
D. Owner shall approve in writing of any transfers or reassignments of maintenance service tasks.

PART 2 PRODUCTS

2.1 APPROVED PRODUCTS

A. Use only cleaning and maintenance products approved for use in Florida Educational Facilities.

PART 3 EXECUTION

3.1 Documentation

A. Provide copies of all letters of maintenance transfers in the project warranty manual.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Format and content of manuals
   2. Instruction of Owner's personnel
   3. Schedule of submittals

1.3 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.4 FORMAT

A. Prepare data in the form of an instructional manual.
B. Prepare data in electronic format and submit on CD or DVD.
   1. Submit four (4) copies of the CD or DVD
   2. When multiple disks are used, correlate data into related consistent groupings
C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of project; identify subject matter of contents.
D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
E. Provide manufacturer's printed data, or typewritten data.
F. Drawings: Provide with reinforced punched binder tab; fold larger drawings to size of text pages.
G. Prepare a table of contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section for each category, identify names, addresses, and telephone numbers of subcontractors and suppliers.
      a. Significant design criteria
      b. List of equipment and parts list for each component
      c. Operating instructions
      d. Maintenance instructions for equipment and systems
      e. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
    a. Shop drawings and product data
    b. Air and water balance reports
    c. Certificates and originals of warranties and bonds

1.5 CONTENTS, EACH VOLUME

A. Provide a table of contents with title of project; names, addresses, and telephone numbers of Architect, Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
B. For each product or system list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
C. Product data - mark each document sheet to identify specific products and component parts, and data applicable to installation, delete inapplicable information.
D. Drawings - supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
    1. Do not use project record documents as maintenance drawings.
E. Typed text as required supplementing product data, providing logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 40 00.
F. Warranties - bind in a copy of each as specified in Section 01 78 36.
G. Bonds - bind in photocopy and original of each.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Building products, applied materials, and finishes - include product data, with catalog number, size, composition, and color and texture designations.
    1. Provide information for reordering custom manufactured products.
B. Instructions for care and maintenance - include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
C. Moisture protection and weather-exposed products - include product data listing applicable reference standards, chemical composition, and details of installation.
    1. Provide recommendations for inspections, maintenance, and repair.
D. Additional requirements as specified in individual product specification sections.
E. Provide a listing in table of contents for design data, with tabbed flysheet and space for insertion of data.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. For each item of equipment and each system, include the description of the unit or system, and component parts identifying function, normal operating characteristics, and limiting conditions.
    1. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
B. Panel board circuit directories - provide electrical service characteristics, controls, and communications by label machine.
    1. Include color-coded wiring diagrams as installed.
C. Operating procedures include:
    1. Startup, break-in, and routine normal operating instructions and sequences.
    2. Regulation, control, stopping, shut-down, and emergency instructions.

3. Summer, winter, and any special operating instructions.

D. Maintenance Requirements include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
E. Provide servicing and lubrication schedule, and list of lubricants required.
F. Include manufacturer's printed operation and maintenance instructions.
G. Include sequence of operation by controls manufacturer.
H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
I. Provide control diagrams by controls manufacturer as installed.
J. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.
K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to keep on hand.
M. Additional Requirements as specified in individual product specification sections.
N. Provide a listing in table of contents for design data, with tabbed dividers and space for insertion of data.

1.8 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct the Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
B. List all equipment requiring seasonal operation performance instructions for other seasons within six months.
C. Use operation and maintenance manuals as basis for instruction.
D. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
E. Prepare and insert additional data in "Operation and Maintenance" manual when need for such data becomes apparent during instruction.

1.9 SUBMITTALS

A. Submit two copies of preliminary draft with proposed formats and outlines of contents before start of work for Architect and Engineer to review and return one copy with comments.
B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after placing equipment into service.
C. Submit Preliminary Draft copy of Operations and Maintenance Manual within 30 days after approval of equipment submittal include the following:
   1. Table of Contents showing proposed sections.
   2. Equipment submittal data
   3. Manufacturer’s Installation Manual clearly marked showing the proposed equipment.
   4. Manufacturer’s Operations and Maintenance Manual clearly marked showing proposed equipment model.
   5. The Manufacturer’s recommended spare parts list
D. Submit two final draft copies of completed volumes fifteen days prior to the scheduled Functional Performance Testing and the Architect/Engineer will return with comments after functional performance testing.
   1. Revise content of all document sets as required prior to final submission.

2. Final Draft Operations and Maintenance Manuals will include updated information from the Preliminary Draft Operations and Maintenance Manuals.
3. Final Draft Operations and Maintenance Manuals will include System Sequence of Operations, including all setpoints, as approved prior to Functional Performance Testing.

E. Submit two sets of Final Operations and Maintenance Manuals, within ten days after final inspection at least fifteen days prior to substantial completion.

F. The Final Operations and Maintenance Manuals will incorporate review comments from the Owner and Architect/Engineer.

G. The Final Operations and Maintenance Manuals shall incorporate any changes in the Systems Sequences of Operations identified during Functional Performance Testing.

PART 2 PRODUCTS

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Preparation and submittal of warranties
   2. Time and schedule of submittals
   3. Transfer of Maintenance responsibility

1.3 FORM OF SUBMITTALS

A. Provide two copies of all warranty information in an electronic format on a compact disk (CD).
B. Provide CD's labeled WARRANTIES, with project number and title, name of responsible company principal, address, and telephone number of Contractor and equipment supplier.
C. Prepare table of contents in the same sequence as the Project Manual, Section 01 78 23; identify each item with the number and title of the correct specification section, and the product name.
D. Separate each warranty with index tab sheets keyed to the table of contents listing.
E. Provide full information on CD as necessary listing subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible company principal.

1.4 PREPARATION OF SUBMITTALS

A. Provide the responsible subcontractors, suppliers, and manufacturers' warranties in duplicate, within ten days after completion of the applicable item of work.
   1. Warranty shall be on the company's' original forms signed by authorized agent only.
   2. Except for items put into use with Owner’s permission, leave start date of warranty period until the Date of Substantial Completion is determined.
B. Verify that documents are in proper form, contain full information, and are notarized.
C. Co-execute submittals when required.
D. Retain warranties until time specified for submittal.
E. All of the above shall be in electronic format included on the CD or DVD, provide 2 copies.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner’s permission, submit documents within ten days after acceptance.
B. Submit other warranties within ten days after Date of Substantial Completion, but prior to final Application for Payment.
C. For warranty items delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

1.6 TRANSFER OF MAINTENANCE RESPONSIBILITY

A. Provide a separate tabbed section in the warranty documents for all letters of maintenance responsibility transference.
B. Provide separate letter for each transfer, which shall include the mutually agreed time and date of the transfer of responsibility.

PART 2 PRODUCTS

2.1 WARRANTY CERTIFICATES

A. The installation contractor shall complete all warranty certificates, registering the product with the manufacturer.
B. Use the date of substantial completion as the installation date.
C. List the product model and serial number on each certificate.
D. Provide copy of the original certificate in warranty manual if the original goes to manufacturer.

PART 3 EXECUTION

3.1 The installing contractor shall fill out all product warranty forms during the manufacture's required time limit.

A. Failure to do so may result in the Owner's loss of standard product coverage in which the installing contractor shall become liable for the same coverage and time limit forfeited due to their omission.
B. The installing contractor shall notify the owner, in a timely manner, of all optional extended warranties provided by the manufacturer and make available to the owner the opportunity to purchase the extended warranty.
C. The installing contractor shall insure that all warranty documents, including copies of completed registration forms, are submitted to the General Contractor for inclusion into their closeout documents as required by Section 01 77 00 of these Specifications.

3.2 Warranty pre-expiration equipment review

END OF SECTION

DIVISION 2

SITE CONSTRUCTION

SECTION 02 41 00
CIVIL SITE DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6(1990) Safety Requirements for Demolition Operations

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Owner's Representative. Remove rubbish and debris daily from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from the property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Owner's Representative.

1.3 SUBMITTALS

Work Plan:

The procedures proposed for the accomplishment of the work shall be set forth in the Work Plan. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations. The Work Plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.4.1 Notifications

Furnish timely notification to the Owner's Representative in writing 10 working days prior to the commencement of work.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris to and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights.

1.6.2 Existing Work

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner; any damaged items shall be repaired or replaced as approved by the Owner's Representative. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements or pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Owner's Representative approval.

1.6.3 Trees

Trees within the project site which might be damaged during demolition, and which are indicated to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected around the critical root zone of individual trees or follow the outer perimeter of branches (drip line) of clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Owner's Representative.

1.6.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.6.5 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the areas being demolished and take immediate action to protect all personnel working in and around the demolition site.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Owner's Representative.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Utilities and Related Equipment

Remove existing utilities, as indicated or as deemed necessary during uncovering by the work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Owner's Representative. When utility lines are encountered that are not indicated on the drawings, the Owner's Representative shall be notified prior to further work in that area.

3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs as indicated on the Drawings. At the connection of new asphalt to existing asphalt, the asphalt, including aggregate base shall be scarified to a depth of 1½ inches below new finish grade. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.6 Concrete

Saw concrete along straight lines to a depth of not less than 2 inches. Make each cut in concrete perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Owner's property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon

approval by the Owner's Representative of the Contractor's demolition and removal procedures, and authorization by the Owner's Representative to begin demolition. The Owner will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated on the Drawings to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated on the Drawings and/or specified to be removed by the Contractor and that are to remain the property of the Owner, and deliver to a storage site located on the Owner's property.

Contractor shall salvage items and material to the maximum extent possible.

Material salvaged for the Contractor shall be stored as approved by the Owner's Representative and shall be removed from Owner property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

Salvaged items to remain the property of the Owner shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.

3.3.7 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed at a legal disposal site approved by the Owner's Representative.

3.4 CLEANUP

Debris and rubbish shall be removed from the project site. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION

SECTION 02 41 13
SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Required demolition of designated existing elements
B. Salvage of designated items

1.3 REFERENCES

A. Comply with NFPA 1 – Chapter 29 and NFPA 241 Standard for Safeguarding Construction Alteration and Demolition Operation 2000 Edition
B. Florida Building Code - FBC

1.4 NOTIFICATION OF OWNERS OF UTILITY LINES AND EQUIPMENT

A. Notify the Owner or local authority owning any conduits, wires, pipes, or equipment affected by demolition work.
B. Arrange for removal or relocation of affected items and pay fees or costs in conjunction with removal or relocation, except as otherwise noted.

1.5 PROTECTION

A. Prior to starting any work on site, provide a safety plan as outlined in Section 453 FBC to the Building Department for approval.
B. Coordinate the implementation of the safety plan with the Owner.
C. Prior to starting demolition operations, provide necessary protection of existing spaces and items to remain.
D. Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. If Owner continues to occupy the facility comply with the following:
    1. Conduct demolition work in a manner that will minimize need for disruption of the Owners normal operations.
    2. Provide protective measures as required to provide free and safe passage of Owner's personnel and public to and from occupied portions of the facilities.
    3. Provide minimum of 72 hours advance notice to Owner of demolition activities that will impact Owners normal operations.
        a. Obtain specific approval from Owner for impact.
E. Owner assumes no responsibility for actual condition of items to be demolished.
    1. Owner will maintain conditions at time of commencement of contract insofar as practical.
F. Protect any exposed existing finish work that is to remain during demolition operations.
G. Erect and maintain dust proof partitions, closures, and ventilator system as required preventing the spread of dust or fumes to occupied portions of the building.
    1. Take whatever precautions necessary to minimize impact on occupied areas.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable codes for demolition of structures, safety of adjacent structures, dust control, runoff, and erosion control, and disposal of demolished materials.
B. Obtain required permits from authorities having jurisdiction.
C. Notify affected utility companies before starting work and comply with their requirements.
D. Do not close or obstruct roadways, sidewalks, and hydrants, without permits.
E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.
    1. Contact the Architect and Owner immediately.
F. Test soils around buried tanks for contamination.
G. No demolition will occur during school hours without the written permission of the Owner.
H. Obtain Indian River County School District Environmental Control Office (ECO) certification/approval prior to demolition/invasive testing.

1.7 EXPLOSIVES

A. The use of explosives is strictly prohibited.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Verify the proper disconnection and capping of all abandoned utilities.
B. Verify that required barricades and other protective measures are in place.
C. Provide necessary shoring, bracing, and other precautions required for proper support of existing structure during cutting and demolition operations.
D. Photograph existing conditions of structure, surfaces, equipment and surrounding spaces that could be misconstrued as damage resulting from selective demolition work; submit photographs and written report of existing damage to Architect prior to starting work.
    1. Contractor shall repair damage caused to existing facilities at no cost to Owner unless they can provide documentation is indicating pre-existing damage.

3.2 DEMOLITION OPERATIONS

A. Comply with alteration precautions and procedures specified in Section 01 35 16.
B. Cut and remove elements and equipment as designated on Drawings.
    1. Remove elements in their entirety unless otherwise indicated.
C. Execute demolition in a careful and orderly manner with least possible disturbance or damage to adjoining surfaces and structure.
D. Exercise extreme caution in cutting and demolition of portions of existing structure.
    1. Obtain approval of Architect prior to cutting or removing structural members for any reason.
E. Avoid excessive vibrations in demolition procedures that may transmit through existing structure and finish materials.

F. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning assessment, removal, handling, and protection against exposure or environmental pollution and immediately contact the Owner.

3.3 DISPOSAL

A. Materials, equipment, and debris resulting from demolition operations shall become property of Contractor.
   1. Remove demolition debris at least once each day in accordance with applicable City, State, and Federal Laws.
B. Cover debris in trucks with approved netting to prevent spillage during transportation.
C. Do not store except in approved containers or burn materials on site.
   1. Remove combustible waste materials in a manner approved by local Fire Department.
   2. Remove, handle, and dispose of any hazardous waste and debris in accordance with applicable City, State, and Federal Laws.
D. Transport demolition debris to off-site disposal area and legally dispose of debris.
E. Use street routes specifically designated by City for hauling debris.
F. When possible dispose of material to recycling centers.

3.4 CLEANING AND REPAIR

A. Leave building broom clean and free of debris, ready to receive new work.
B. Repair demolition performed in excess of that required.
   1. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition.

END OF SECTION

SECTION 02 41 16
BUILDING DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.
B. A set of plans that show which buildings and utilities are being removed, demolished, or modified; and the buildings and utilities remaining.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Demolition of designated structures or portions thereof and removal of materials from site
   2. Demolition and removal of foundations and slabs-on-grade
   3. Disconnecting and removal of identified utilities
   4. Removal of underground tanks and piping
   5. Salvage of designated items.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Shop Drawings: Indicate demolition and removal sequence and storage location for salvageable items; location and construction of barricades, fences, and temporary work.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 77 00
B. Accurately record actual locations of capped utilities, subsurface obstructions, and structures

1.5 QUALIFICATIONS

A. Demolition Firm: Company specializing in performing the Work of this Section with minimum five years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable codes for demolition of structures, safety of adjacent structures, dust control, runoff, and erosion control, and disposal of demolished materials.
B. Obtain required permits from authorities having jurisdiction.
C. Notify affected utility companies before starting work and comply with their requirements.
D. Do not close or obstruct roadways, sidewalks, and hydrants, without permits.
E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.
   1. Contact the Architect and Owner immediately.
F. Test soils around buried tanks for contamination.

G. No demolition will occur during school hours without the written permission of the Owner.
H. Obtain Indian River County School District Environmental Office certification/approval prior to demolition/invasive testing.

1.7 ABATEMENT

A. The Owner will provide an abatement survey.
B. The Owner or his contractor will remove ACM friable or potentially ACM friable hazardous material.
   1. The Owner's contractor will also remove other hazardous material.
C. The Owner will pay all costs of abatement, and for the cost of disposal of fluorescent tubes and ballasts.

1.8 SALVAGE

A. The Owner has the first right to salvage reusable equipment.

1.9 DEMOLITION

A. Demolition is by the Owner or under the general construction contract, as indicated on the drawings.
B. DO NOT use Explosives during demolition or construction.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Material: Type fill as specified in Division 2.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices.
B. Protect existing landscaping materials, appurtenances, structures that are not to be demolished.
C. Prevent movement or settlement of adjacent structures.
   1. Provide bracing and shoring.
D. Mark location of utilities.

3.2 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures.
B. Cease operations immediately if adjacent structures appear to be in danger.
   1. Notify Architect and Owner.
   2. Do not resume operations until directed.
C. Conduct operations with minimum interference to public or private accesses.
   1. Maintain egress and access at all times.
D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
E. Sprinkle work with water to minimize dust.

1. Provide hoses and water connections for this purpose.

3.3 DEMOLITION

A. Disconnect, remove, cap, and identify all utilities within demolition areas.
   1. Properly disconnect and terminate all water, sewer, storm, gas, and electrical lines leading to the demolition area as required by code or local utility company.
B. Remove foundation walls and footings to a minimum of two feet below finished grade beyond area of new construction.
C. Remove concrete slabs on grade.
D. Empty buried tanks located within demolition area, remove tanks, components, and piping from site. Dispose of materials removed from tanks per applicable codes and regulations
E. Remove materials being re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00.
F. Backfill areas excavated because of the demolition, in accordance with Division 2.
G. Rough grade and compact areas affected by demolition to maintain site grades and contours.
H. Remove demolished materials from site, and dispose of materials per applicable codes and regulations.
I. Do not burn or bury materials on site, leave site in clean condition.
J. Remove temporary work.
K. When possible dispose of material to recycling centers.

END OF SECTION

DIVISION 3 CONCRETE

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 FORMWORK FOR CONCRETE

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Concrete formwork materials.
   2. Related accessories

1.3 REFERENCES

A. ACI 117 – Tolerances for Concrete Construction and Materials
B. ACI 301 – Specifications for Structural Concrete Buildings
C. ACI 318 – Building Code Requirements for Structural Concrete
D. ACI 347 – Guide to Formwork for Concrete
E. ACI SP-4: Formwork for Concrete
F. ANSI/ASME A17.1 – Safety Code for Elevators and Escalators
G. ASTM E1643 – Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
H. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
I. ASTM 1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
J. ASTM – D994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
K. ASTM – E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.

1.4 SYSTEM DESCRIPTION

A. Concrete Formwork: For surfaces of cast-in-place concrete to be unexposed or to receive rubbed finish.
B. Form footings and slabs on grade, earth forming is not allowed.
C. Design/Performance Requirements: Design, engineering and construction of formwork and shoring is the responsibility of the Contractor.
   1. Design formwork with sufficient strength to withstand forces due to placement and vibration and sufficient rigidity to maintain specified tolerances.
   2. Design loads, lateral pressure, and allowable stresses in accordance with ACI 347.

1.5 SUBMITTALS

A. Product Data: Proprietary materials and items, including forming accessories, water stops, joint systems, and others.
B. Shop Drawings:
   1. Show form construction including jointing, special form joints and reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually..

1.6 QUALITY ASSURANCE

A. Qualifications
   1. Formwork Contractor: Florida licensed contracting firm having 5 years successful experience in fabrication and erection of formwork systems of similar scope and complexity as required for this project. Contractor shall have sufficient capacity to produce formwork without causing delay in work.

1.7 FORMWORK AND RESHORING DESIGN

A. Formwork:
   1. Comply with ACI 301.
   2. Design formwork, shores and reshores according to ACI 117 and ACI 347, including provisions for construction loads and placing equipment to be used on project.
   3. Verify strength and stiffness of in-place building elements to resist required loads and restrict deformations to specified tolerances.
   4. Earth cuts shall not be used as forms for vertical surfaces. Comply with OSHA's "Trench Safety Act".
   5. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.
B. Removal Strength:
   1. Wall forms and column forms may be removed 12 hours after pouring.
   2. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength or as otherwise required by ACI 347. Beams shall be reshored immediately upon removal of forms.
   3. In addition to the above, flat slab forms and stair slab forms shall not be removed for 5 days. Upon removal of forms, reshores shall be placed and remain in place until concrete is 14 days old or as otherwise required by the formwork engineer.
   4. Where side forms of walls, beams, or columns are supported other formwork, the removal time for the latter shall govern.
   5. Supporting forms and shores must not be removed from beams, floors, columns and walls until these structural units are strong enough to carry their own weight and any approved superimposed loads.
   6. Strength of concrete shall be determined from testing of job-cured concrete cylinders. Cost of cylinder casting and testing of job-cured specimens cast for this use shall be borne by the contractor.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Concrete Forms for Beams, Columns, and Slabs:

1. New or properly reconditioned material designed to conform to requirements of ACI SP-4 and to support wet concrete without deflection.
2. Plywood Panels: PS-1 B-B plywood, Class 1, EXT-APA, sanded, mill oiled, and edge sealed.

B. Forms for Exposed Finish Concrete
1. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, or other acceptable panel-type materials. Provide continuous, straight, smooth, exposed surfaces. Earth forming for foundations is prohibited, except for monolithic footings.
2. Furnish in largest practicable sized to minimize number of joints and to comply with joint system shown on drawings.
3. Provide form material with sufficient thickness to withstand pressure of newly placed concrete, restricting bow and deflection to specified tolerances.
4. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge sealed, with each piece bearing legible inspection trademark.
5. Where concrete is scheduled to have Smooth Rubbed Finish (Sm Rb-Fn), use plywood complying with U.S. Product Standard PS-1 "B-B (Medium Density Overlaid Concrete Form", Class I, with each piece bearing legible inspection trademark.

C. Forms for Unexposed Finish Concrete: Form concrete surfaces to be concealed in finished structure with plywood, lumber, metal, or other material.

D. Forms for Textured Finish Concrete:
1. Form textured finish concrete surfaces with units of face design, arrangement, and configuration as shown on drawings or as required to match A/E'S control sample.
2. Provide form supports to ensure stability of textured form liners.
3. Form liners shall be Fitzgerald pattern #17911 "San Diego Dry Stack". Form material type shall be "Vinylok" abs.

2.2 RELATED MATERIALS

A. Vapor Retarder: Use polyethylene sheet not less than 10 mils thick or other materials resistant to decay when tested according to ASTM E154.

B. Form Coatings: Colorless commercial formulation form release and sealer compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
1. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

C. Form Ties: Adjustable length, removable or snap off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal, 1½" break back, and maximum hole left 1¼" diameter.
1. Form Ties: Ties that leave plastic tube lined holes through members are not allowed. Provide units that will leave no metal closer than 1 and 1.5 inches to exposed surface. Provide ties that will leave holes no larger than 1 inch diameter in concrete surface.

D. Bevels and Rustications: Wood strips milled to shapes indicated or formed rigid plastic strips.

E. Dovetail Anchor Slots: 24-ga. galvanized steel with release tape sealed slots and bent tab anchors.

F. Flashing Reglets shall be 16-oz. copper with release tape sealed slots and alignment splines at end joints.

G. Construction Joints shall be 24-ga. galvanized steel keyway form type with knockout holes spaced 6" o. c. to receive doweling.
H. Carton Forms: Fiberboard void boxes capable of supporting min. load of 600 lbs./sq ft
I. Form Joint System for Architectural Concrete Forms:
   1. Gaskets shall be closed cell foam tape - Source Product/Mfg. - No. 4016 by 3M.
   2. Caulk: Rubberized, non-staining silicone compound GE Product/Mfg. - No. 1201.
   3. Tape: 1 or 2 mil Mylar - source Product/Mfg. - No. 371 by 3M.
J. Mastic Water stop: Preformed plastic or butyl resin strips. Source Products/Mfg:
   1. Synko-Flex/Synko-Flex Products Co.
   2. ConSeal CS-102/Concrete Sealants
K. Joint Fillers: Pre-molded mastic strips, asphalt impregnated, ASTM D994, ½ inch thick.
L. Fasteners and Anchorages: Nails, spikes, bolts, lag bolts, and other types sized as required to maintain formwork in place.
M. Forming Accessories: CRD-C572-74 polyvinyl chloride (PVC).
   1. Waterstops: Flat dumbbell type at construction joints and center bulb type at building expansion joints.
   2. Chamfers: 1/2 inch radius on outside corners of exposed-to-view concrete unless drawings show other size or shape.
   3. Drips: 3/8 inch wide x 1/2 inch high drip groove placed 3/4 inch back from edge in cast-in-place exterior soffits.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and measurements required before proceeding with formwork.
B. Coordinate the installation of joint materials, reinforcing steel, and vapor retarders with placement of forms.

3.2 INSTALLATION TOLERANCES

A. Allowable tolerances for Structural Concrete Forms shall comply with ACI 301 and 347.
B. Allowable tolerances for camber in slabs and beams shall comply with ACI 301.
C. Allowable tolerances for plumbness in elevator shafts shall comply with requirements of ANSI/ASME A17.1.

3.3 ERECTION

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that may occur before permanent bracing can support such loads.
B. Construction:
   1. Construct formwork so finished concrete members and structures are of correct size, shape, alignment, elevation, and position.
   2. Build formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
   3. Provide openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required.
   4. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

5. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
6. Provide temporary openings at bottoms of forms to facilitate cleanout and inspection.
    a. Close openings with tight fitting panels and neat joints so that joints will not be apparent in exposed concrete surfaces.

C. Chamfer exposed corners and edges as indicated, or if not indicated, provide ¾" x ¾".
1. Chamfer exposed corners and edges as shown on Drawings, using wood, metal, PVC, rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Provide corners and edges with 1/2 inch radius PVC accessories to produce uniform smooth lines and tight edge joints, unless otherwise indicated or accepted by A/E.

D. Provide openings in concrete formwork to accommodate work of other trades.
1. Determine size and location of openings, recesses, and chases from trades providing such items.
2. Accurately place and securely support items built into forms.

E. Thoroughly clean forms and adjacent surfaces to receive concrete.
1. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.
2. Retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.

F. Construction Joints:
1. Locate and install formed construction joints at rustications or, if not indicated, locate so as not to impair strength and appearance of the structure, and as approved by the A/E.
2. Provide keyways at least 1½" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
3. Place construction joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints, except as otherwise indicated.

G. Isolation Joints in Slabs-on-Ground: Construct continuous joint filler at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundations walls, grade beams, and elsewhere as indicated.

H. Contraction (Control) Joints in Slabs-on-Ground:
1. Construct contraction joints in slabs-on-ground to form panels of patterns as shown on drawings or as indicated by Architect.
2. Use inserts 1/4 inch wide x 1/4 of slab depth, unless otherwise indicated.
3. Form contraction joints by inserting pre-molded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
4. Contraction joints may be formed by saw cuts (when permitted by the drawings) as soon after slab finishing as possible without dislodging aggregate or tearing or raveling the concrete. Depth of cut shall be 1/4 of slab depth.

I. Water stops: Provide mastic water stops in construction joints of below grade walls and in joints between below grade slabs and walls.
1. Install water stops to form continuous diaphragm in each joint.
2. Fabricate field joints in water stops in accordance with manufacturer's printed instructions.

J. Form Coatings: Apply after erecting forms and sealing the joints but prior to placing reinforcing steel, anchoring devices, and embedded items.
1. Seal surfaces of wood rustications with two coats of form sealer.
2. Spray-apply one coat of release agent to formwork faces except concrete surfaces scheduled to receive special finishes or special coatings.
3. Coat steel forms with a non-staining, rust- preventative form oil to protect against rusting.
    a. Rust-stained steel formwork is not acceptable.

K. Embedded Items: Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by, cast-in-place concrete.
L. Reglets: Install to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
M. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E1643 and manufacturer's written instructions.
N. Form Ties:
    1. Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
    2. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2 inch inside concrete.
    3. Unless otherwise shown, provide form ties that will not leave holes larger than 1-inch diameter in concrete surface.
O. Provisions for Other Trades:
    1. Provide openings in concrete formwork to accommodate work of other trades.
    2. Determine size and location of opening, recesses, and chases from trades providing such items.
    3. Accurately place and securely support items built into forms.
    4. Accurately place and securely anchor embeds prior to the placing of concrete.

3.4 RE-USE OF FORMS

A. Clean re-used forms of concrete matrix residue, repair, and patch as required returning forms to acceptable surface condition.
B. Recoat contact surfaces of forms with a form-coating compound as specified.

3.5 SHORES AND SUPPORTS

A. Comply with ACI 347 for shoring and re-shoring in multistory construction, for beams, girders, raised slabs, and as herein specified.
B. Space all shoring in such a manner as to prevent any floor or member from excessive loading or inducing stress in any of the concrete members.
    1. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

3.6 REMOVAL OF FORMS AND SHORING

A. Remove formwork and shoring progressively and in accordance with ACI 301 and ACI 347 to prevent unbalanced loads on the structure.
B. Do not remove shoring and formwork until members have acquired strength as specified by the engineer of record.
    1. Re-shore structural members as original shores are removed as specified by the engineer of record.
C. In the event the Contractor wishes to remove formwork at an earlier time than specified, the Contractor shall pay for and have testing laboratory obtain two additional concrete test cylinders to confirm strength requirement for early form removal.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.3 REFERENCES

A. ACI 117 – Tolerances for Concrete Construction and Materials
B. ACI 315 – Details and Detailing of Concrete Reinforcement
C. ACI 301 – Structural Concrete for Buildings
D. ACI 318 – Building Code Requirements For Reinforced Concrete
E. ACI SP-66 – American Concrete Institute - Detailing Manual
F. ASCE 7 – American Society of Civil Engineers - Wind Loads
G. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
H. ASTM A184 – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
I. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
J. ASTM A496 – Standard Specification for Steel Wire Deformed for Concrete Reinforcement
K. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement Deformed for Concrete
L. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
M. ASTM A706/A706M – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
N. ASTM A767 /A767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
O. ASTM A775 /A775M – Standard Specification for Epoxy-Coated Reinforcing Steel Bars
P. ASTM D3963/D3963M – Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Bars
Q. AWS D1.4 – Structural Welding Code-Reinforcing Steel
R. CRSI – Concrete Reinforcing Steel Institute - Manual of Standard Practice
S. CRSI – Placing Reinforcing Bars
T. FBC – Florida Building Code

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 – Submittals Procedures
B. Shop Drawings: Detail reinforcing in compliance with ACI 315.
   1. Provide fully detailed bar lists, bending diagrams, and placing plans.
   2. Indicate splices and splicing methods.
   3. Indicate types and grades of steel.
   4. Indicate quantities of reinforcing steel and wire fabric.
   5. Indicate supporting and spacing devices.
C. Product Data: Manufacturer's specifications and brochures for bar support devices.
D. Reports: Certified copy of all mill reports on reinforcing steel, indicating physical properties and chemical analysis.
E. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
   1. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials: *(Provide materials extracted/harvested and manufactured within a 500 mile radius from the project site).*
      a. Sourcing Location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing Location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
F. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
G. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement.
   1. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement and accessories.
   2. Include special reinforcement required at openings through concrete structures.
H. Shop drawings made from sepias (or other reproductive methods) of the structural drawings will not be accepted and shall be cause for resubmittal.
   1. Selection of splices: Splices shall be full tension, unless noted otherwise.
I. Welding Submittals:
   1. If welding of reinforcing bars is to be included as part of the work, submit the following:
      a. A complete welding procedure specification according to AWS D1.4.
      b. A certified chemical analysis of the steel to be welded.
      c. Carbon equivalence calculations according to AWS D1.4.
      d. Qualification papers for welders who will be employed on the project. Welders shall have passed a qualification test within a 12 month period before the work or furnish a statement from a testing agency acceptable to A/E that they have observed or tested that welder's work under similar requirements within the past 6 months.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 – Submittals Procedures
B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
C. Submit certified copies of mill test report of reinforcement materials analysis.

1.6 DESIGN REQUIREMENTS

A. Design shall comply with the FBC, ASCE 7 – Wind Loads, and ACI 318.
B. Do not weld reinforcing steel.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301. Maintain one copy of document on site.
B. Design reinforcement under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
C. Submit under provisions of Section 01 40 00 Manufacturer's Certificates, certifying welders employed on the work, verifying AWS qualification within the previous 12 months.
D. Steel Contractor: Florida licensed contracting firm having 5 years successful experience in fabrication and erection of reinforcing steel of similar scope and complexity as required for this project. Contractor shall have sufficient capacity to install reinforcing steel without causing delay in work.

PART 2 PRODUCTS

2.1 REINFORCING MATERIALS

A. Comply with Chapter 5 of ACI 301.
B. Reinforcing Steel:
    1. Bars #3 through #11 shall be deformed bars according to ASTM A615 Grade 60 and according to the additional requirements of Paragraph 5.2.2.1 of ACI 301.
    2. Bars #2 in size shall be plain round meeting A615/A-96a Grade 40.
    3. Welded wire fabric shall be of plain wire.
    4. Unless indicated otherwise the minimum concrete protective cover specified in ACI 301 is the specified cover for this project unless indicated otherwise.
    5. Mechanical Connectors and Splice Devices: Proprietary products suitable for the use intended and listed in ACI 439-3R-83.
    6. Steel Wire: ASTM A82, plain, cold-drawn, steel.
    7. Fabricated Deformed Steel Bar Mats: ASTM A184.
    8. Welded Steel Wire Fabric: ASTM A185.
    9. Deformed Steel Wire: ASTM A496.
    10. Welded Deformed Steel Wire Fabric: ASTM A497.
    11. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI Class C or Class A as required acceptable.
C. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Maximum spacing of supports is 3 feet in both directions.

D. For exposed-to-view concrete surfaces and with legs of supports in contact with forms, provide supports with plastic bar supports according to CRSI, Class 1.
E. Provide custom supports as required to support top layer of mats and other special conditions not provided for within CRSI standards.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 318.
B. Weld reinforcement in accordance with AWS D1.4.
C. Locate reinforcing splices not shown on plans, at point of minimum stress and review with A/E.

PART 3 EXECUTION

3.1 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as specified.
B. Clean reinforcement of loose rust and mill scale, dirt, and other materials that reduce or destroy bond with concrete.
C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.
D. When any reinforcing bar is placed projecting either horizontally or vertically from a given element to subsequently lap with other reinforcing bar, verify the detailed lap length will be achieved.
    1. Report any deviation to the A/E for correction before placing concrete in the first element.
    2. Bar projections resulting in laps shorter than the detailed laps shall be considered rejected, and corrective measures shall be taken at the direction of the A/E with no additional cost to the Owner.
E. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh plus 2 inches and wire splices. Offset end laps in adjacent widths to prevent continuous laps in either direction.
G. Provide the A/E with not less than 48 hours notice before starting any welding of reinforcing bars.
    1. Welding of reinforcing bars shall only be allowed under the direct supervision of the A/E.
    2. Welding of crossing reinforcing bars is not allowed.
    3. Any bars with unauthorized or unacceptable welds shall be replaced at no additional cost to the Owner.

3.2 SPLICES

A. Splices noted on the drawings to be compression splices shall be furnished by one of the following:

1. Compression lap splices according to ACI 315. Mechanical compression only connectors according to ACI 439, staggered ½ Class "B" lap length and maintaining not less than ¼ the total tensile capacity of any column face.
2. Full penetration welds staggered not less than 18 diameters.

B. Splices shown on the drawings as either Class "A" or Class "B" may be one of the following:
1. Class "B" lap splices.
2. Class "A" (but not less than compression lap) lap splices staggered not less than one Class "B" lap length.
    a. Exception: This shall not be allowed when shown as class "B" in a location which by design, has already accounted for other continuing bars or staggered splices.
3. Appropriate mechanical connectors according to ACI 439 staggered not less than 24 diameters.
4. Full penetration welds staggered not less than 24 diameters.

C. Unless otherwise noted in the drawings, reinforcing shall be spliced to develop the full strength of the bar in either tension or compression. Those splices shall be furnished by one of the following:
1. Class "B" lap splices where only ½ of the total rebars are spliced at any one floor.
2. Full penetration welds staggered not less than 36 diameters.
3. Appropriate mechanical connectors according to ACI 439-3R staggered not less than 36 diameters.

D. Total steel at lap splices shall not exceed 8 percent for columns or shear wall cores containing the splice bars.
1. All bars may be lapped at one section for up to 4 percent steel.
2. ½ of the bars may be lapped for up to 5.3 percent steel.
3. 1/3 of the bars may be lapped for up to 6 percent steel.
4. Above 6 percent steel, other splice choices shall be used.

E. Where staggered lap splices are used, provide a mixture of bar sizes as appropriate where vertical bar size changes on the drawings.

F. Where different size bars are lap spliced, the length of splice may be based on the smaller bar size. If there is a larger quantity of the smaller bar size, the splice length shall be based on the larger bar.

G. It shall be the responsibility of the reinforcing detailer to determine the concrete strength at the point of a lap splice, the bar position (top or other), bar spacing, confinement condition based on ties or stirrups or edge condition to select the proper lap length.

H. Increase laps for bundled bars according to ACI 318, with number based on total bars in-group including lapped bars.
1. Detailing of Splices: Placing shop drawings shall specifically show splice lap lengths where they occur. Bar diameter lap tables and references to other charts are not acceptable.
2. Staggered Laps Required: Provide staggered laps in any member as necessary to keep space between bars within splice zone at least 1 inch or 1 bar diameter clear.
   Detailing of Bar Placement: For any bar other than those placed at an edge condition, between edge condition or openings, or any other location where the bar cannot be shifted longitudinally, a dimension shall be shown from an identifiable building grid, wall, or edge to at least one end of the bar.
3. Congested Areas of Placement: For any conditions resulting in bar spacing less than 2 diameters clear or where the placement of bars in one member requires critical templating to allow bar placement in an intersecting member, furnish details of sufficient scale to show clearances, spacing, and arrangements for properly placing those bars.

4. Accessories: Show accessories, supports, chairs, bolsters, and spacers necessary to complete the installation. Where supports are beyond the scope of CRSI detailing standards and custom designed supports are required, provide engineering calculations demonstrating the capacity of the system.
5. Flat Plates: Provide not less than 3 separate drawings of each plate separately showing bottom bars, top bars, and accessories.

I. Alternate Reinforcing Splicing:
1. Splices shown in the drawings shall be considered mandatory for base bid purposes.
2. Alternative methods of providing for splices are available within the constraints of this specification and ACI 318.
3. If alternative splices are desired, the shop drawing submitted shall clearly indicate the change and include authorization by any other subcontractors involved in the change.

3.3 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Cast-in-place concrete building frame members, floors, shear walls, elevator shaft walls, columns, beams, foundation walls, footings, and supported slabs.
B. Floors and slabs on grade.
C. Control, expansion, and contraction joint devices associated with concrete work, including joint sealants.
D. Equipment pads, light pole base, flagpole base, thrust blocks, and manholes.

1.3 REFERENCES

A. ACI 117 – Standard Tolerances for Concrete Construction and Materials
B. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
C. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete
D. ACI 301 – Specifications Structural Concrete for Buildings
E. ACI 302 – Guide for Concrete Floor and Slab Construction.
F. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete
G. ACI 305R – Hot Weather Concreting.
H. ACI 306R – Cold Weather Concreting.
I. ACI 308 – Standard Specification for Curing Concrete
J. ACI 309 – Guide for Consolidation of Concrete
K. ACI 318 – Building Code Requirements for Structural Concrete
L. ACI 347 – Guide to Formwork for Concrete
M. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
N. ASTM C33 – Standard Specification for Concrete Aggregates
O. ASTM C39C39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
P. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete
Q. ASTM C150 – Standard Specification Portland Cement
R. ASTM C260 – Standard Specification Air Entraining Admixtures for Concrete
S. ASTM C330 – Standard Specification Light Weight Aggregates for Structural Concrete
T. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
U. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use in Concrete
V. ASTM C948 – Standard Test Method for Dry and Wet Bulk Density, Water Absorption and Apparent Porosity of Thin Sections of Glass-Fiber-Reinforced Concrete

W. ASTM C1017/C1017M – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
X. ASTM D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
Y. ASTM C143 – Standard Test Method for Slump of Portland Cement Concrete
Z. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete
AA. ASTM D1190 – Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type
BB. ASTM D1751 – Standard Specification Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
CC. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
DD. FBC – Florida Building Code
EE. Florida Department of Transportation – Standard Specifications for Road and Bridge Construction
FF. ASCE 7 – Minimum Design Loads for Buildings and other Structures.
GG. ASCE 37 – Design Loads on Structures During Construction

1.4 SUBMITTALS FOR REVIEW and INFORMATION

A. Mix Designs: Submit mix designs to Engineer for review 20 days before first placement. Do not proceed without Engineer's written approval.
   1. Mix design shall include laboratory test results or production records of 30 consecutive tests as defined by ACI 301.
   2. Indicate material content per cubic yard of each class of concrete furnished:
      a. Saturated surface-dried weights of fine and course aggregate.
      b. Type and name of admixtures.
      c. Wet unit weight of each concrete mix.
B. Certificates:
   1. Manufacturer's certification that materials meet specification requirements.
   2. Ready-mix delivery tickets, ASTM C94.
C. Product Data: Submit product data for all admixtures proposed for use.
D. Related Materials: Submit product data for all proposed release agents, curing compounds and evaporation reducer, and polypropylene fibers that demonstrate conformance to specification.
E. Shop Drawings: Indicate floor plan and precise locations of all control construction and expansion joints. Submit drawings for reinforcement, for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66 "ACI Detailing Manual" showing bar schedules, stirrup spacing diagrams of bent bars, and arrangement of concrete reinforcement.
F. Records: Retain records of all concrete poured, including; exact mix proportions, slump, air content test, strength, date, time, location of the placement, weather conditions at the time of placement, and the source of concrete. Submit copy to Engineer.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 Contract Closeout: Procedures for submittals
B. Accurately record actual locations of embedded utilities and components concealed from view.

1.6 DESIGN REQUIREMENTS

A. Design in conformance with Florida Building Code, ACI 318, and ACI 301.

B. Provide expansion joints, control joints, construction joints, and isolation joints to prevent uncontrolled stress cracks in the structure and according to the latest engineering standards.
C. Product Data: Provide data on mix designs (with curing rate/time) joint devices, attachment accessories, admixtures, curing compound, sealers, and integral coloring. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
    1. Recycled Content:
        a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
        b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
        c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
        d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
    2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500 mile radius from the project site.
        a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
        b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
        c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
        d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
    3. Biobased materials:
        a. Indicate type of biobased material in product.
        b. Indicate the percentage of biobased content per unit of product.
        c. Indicate relative dollar value of biobased content product to total dollar value of product included in project.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 318.
B. Mix and deliver ready mixed concrete in accordance with ASTM C94/C94M.
C. Maintain one copy of each document on site.
D. Acquire cement and aggregate from same source for all work.
E. Conform to ACI 305R when concreting during hot weather.
F. Conform to ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I – Normal, Portland type, or Type II.
    1. Fly Ash: Comply with ASTM C618; Report the chemical analysis of the fly ash in accordance with ASTM C311. Evaluate and classify fly ash in accordance with ASTM D5759.
        a. Recycled Content: Provide pre-consumer recycled content.

2. Slag Cement: Comply with ASTM C989.
    a. Recycled Content: Provide pre-consumer recycled content.
3. Silica Fume: Comply with ASTM C1240
    a. Recycled Content: Provide pre-consumer recycled content.

B. Fine and Coarse Aggregates: ASTM C33.
1. Aggregate: Recycled porcelain, concrete, stone, or other recycled content material conforming to requirements of mix design
    a. Recycled Content: Provide post-consumer recycled content, or pre-consumer recycled content.

C. Lightweight Aggregate: ASTM C330
D. Water: Clean and not detrimental to concrete complying with ACI 301.
E. Glass Fiber Reinforcement: ASTM C948

2.2 ADMIXTURES

A. Admixtures, General: All concrete shall contain a Type A or D admixture in the basic design with dosages high enough to reduce water by at least 7 percent from the same mix without the admixture. No admixture shall have added chloride in its manufacture. Add all admixtures at the concrete batch plant.
1. Air-Entraining agent: Shall conform to ASTM C 260. (if used)
    a. MB AE 90 or MB-VR by Master Builders.
    b. Darex by WR Grace & Co.
    c. Air Mix by Euclid Chemical Co.
2. Water-Reducing Admixture: Shall conform to ASTM C 494 Type A (if used).
    a. Pozzolith 200N or Pozzolith 322N by Master Builders.
    b. WRDA 60 by WR Grace & Co.
    c. Eucon WR 75 by Euclid Chemical Co.
3. Water-Reducing Retarding Admixture: Shall conform to ASTM C 494 Type D.
    a. Pozzolith 961R or Pozzolith 200N by Master Builders.
    b. WRDA 60 by WR Grace & Co.
    c. Eucon WR by Euclid Chemical Co.
4. Mid-Range Water-Reducing Admixture: Shall conform to ASTM C 494 Type A or F.
    a. Polyheed 997 by Master Builders.
    b. Mira 70 by WR Grace & Co.
    c. Eucon MR by Euclid Chemical Co.
5. High-Range Water-Reducing Admixture (Superplasticizer): Shall conform to ASTM C 494 type F.
    a. Rheobuild or PS 1232 by Master Builders.
    b. Adva Flow by WR Grace & Co.
    c. Eucon 37 by Euclid Chemical Co.
6. Fibrous Concrete Reinforcement: Shall meet ASTM C-1116 Type III 4.1.3 and ASTM C-1116. Shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as concrete reinforcement at a minimum of 0.1 percent by volume for the control of cracking due to plastic shrinkage and thermal expansion/contraction

2.3 ACCESSORIES

A. Evaporation Reducer: Shall be specially formulated material to be sprayed on fresh concrete to prevent rapid drying during hot and windy weather and reduce plastic shrinkage cracking.

Sprayed over plastic concrete, the material produces a monomolecular film that holds the water in until the next finishing operation. Product shall contain a yellow fluorescent color tint to easily identify the areas covered.
1. Confirm by Master Builders.
2. Eucobar by Euclid Chemical Co.
3. Sikafilm by Sika Corp.

B. Liquid Membrane-Forming Curing Compound: Shall be a membrane-forming curing compound complying with ASTM C 309, Type I, except that minimum solids content shall be 30% and moisture loss shall not exceed 0.040 gm/cm2 of surface in 72 hours at a coverage rate of 2 coats at 300 sq. ft per gallon.
1. Masterkure 200W by Master Builders.
2. Super Aqua-Cure VOX by Euclid Chemical Co.
3. Kure-N-Seal 30 by Sonneborn.

C. Epoxy Adhesives: Two component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces.
1. Concresive LPL by Master Builders.
2. EpoGrip by Sonneborn.
3. Hi-Mod Epoxy Adhesive by ThoRock.

D. Epoxy Joint Filler: Two components, 100% solids compound with minimum Shore D hardness of 60 and a maximum of 65.
1. Masterfill 300 I by Master Builders.
2. Epolith by Sonneborn.
3. Sikadur 51 by Sika Corp.

E. Preformed concrete joint filler.
1. Asphalt Saturated Filler, ASTM D1751.
2. Recycled Rubber, ASTM D1752.

F. Moisture-Retaining Cover: Shall be one of the following, complying with ASTM C171.
1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

G. All coatings/sealants shall be compatible with each other and applied floor finishes or be completely removed prior to application of other coating or finish.

H. Bonding Agent: Shall conform to ASTM C881 Type 2, Grade 2 Class B and C.
1. Concresive 1414 by Master Builders.
2. Engineer Approved Alternative

I. Construction Joint Devices: Integral galvanized steel; formed to tongue and groove profile, with removable top strip exposing sealant trough, ribbed steel spikes with tongue to fit top screed edge.

J. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric filler strip with a Shore A hardness of 35 to permit plus or minus 25% joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush mounted; color as selected.

K. Sealant and Primer: Type, as specified in Section 07 92 00

L. Sealant: Cold applied

2.4 CONCRETE MIX

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an

independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

Concrete Use	Compressive Strength	Maximum water/cementitous ratio
Slab-on-ground and Foundations	3000 psi	0.5
All other columns, beams, and all other concrete	3000 psi	0.5

C. Slump Limits: Maximum slump of all concrete at point of placement shall be **5" +1** inches.
D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.
E. Use of aggregate smaller than **#57** is prohibited in foundations and slabs

2.5 CONCRETE FORMWORK

A. Wood Forms:
   1. Lumber as specified in Section 06 10 00 – Rough Carpentry.
   2. Sheathing as specified in Section 06 10 00 – Sheathing.
B. Plastic Forms: Plastic lumber as specified in Section 03 47 13 – Plastic Fabrications.
   1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option.
C. Insulating Concrete Forms:
   1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option.
   2. Toxicity/IEQ: No CFCs, HCFCs and other ozone-depleting substances used or released during manufacture.
D. Carton Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set.
   1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option.
E. Form Release Agent: Colorless biobased oil which will not stain concrete.
   1. Biobased Content: Minimum 10 percent soy-based oil or other biobased material.
   2. Toxicity/IEQ: Low VOC.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.
B. Verify requirements for concrete cover over reinforcement.
C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
B. In locations where doweling new concrete to existing work, drill holes in existing concrete; insert steel dowels and adhere with approved epoxy.
C. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
D. Remove all foreign matter and water from forms or structural excavations.

3.3 FORMWORK

A. Conform to ACI 347
B. Form foundations, earth forms not allowed, unless Engineer of record and the Soil's report can provide information to building official showing the soil conditions are conducive to earth forms.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 301, ACI 304 and ensure compliance with ASCE-37.
B. Notify A/E minimum 24 hours prior to commencement of operations.
C. Ensure reinforcement, inserts, embedded parts, formed expansion, and contraction joints are not disturbed during concrete placement.
D. Treat for termites per section 31 31 16.
E. Install vapor retarder under interior slabs on grade, lap joints minimum 6", and seal watertight by taping edges and ends.
F. Repair vapor retarder damaged during placement of concrete reinforcing.
    1. Repair with vapor retarder material; lay over damaged areas minimum 6" and seal watertight.
G. Separate slabs on grade from vertical surfaces with joint filler.
H. Place joint filler in floor slab pattern placement sequence.
    1. Set top to required elevations.
    2. Secure to resist movement by wet concrete.
I. Extend joint filler from bottom of slab to within ¼" of finished slab surface.
    1. Conform to Section 07 92 00 for finish joint sealer requirements.
J. Install joint devices in accordance with manufacturer's instructions.
K. Install construction joint devices in coordination with floor slab pattern placement sequence.
    1. Set top to required elevations.
    2. Secure to resist movement by wet concrete.
L. Install joint device anchors.
    1. Maintain correct position to allow joint cover to be flush with floor and wall finish.
M. Install joint covers in one-piece length, when adjacent construction activity is complete.
N. Apply sealants in joint devices in accordance with Section 07 92 00.
O. Maintain records of concrete placement.
    1. Record date, location, quantity, air temperature, and test samples taken.
P. Place concrete continuously between predetermined expansion, control, and construction joints.
Q. Do not interrupt successive placement; do not permit cold joints to occur.
R. Place floor slabs in checkerboard or saw cut pattern indicated.

S. Saw cut joints shall be made as soon as the aggregate has hardened sufficiently to prevent being dislodged by the saw blade.
   1. Use $^{3}/_{16}$" thick blade, cut into ¼ depth of slab thickness.
T. Screed floors and slabs on grade level, maintaining surface flatness of maximum ⅛" in 10'.
U. Tool edges and corners to be exposed in the finished work to approximately a ¼ inch radius, unless otherwise detailed.

3.5 CONSOLIDATION OF WALLS, COLUMNS, BEAMS AND SLABS OVER EIGHT-INCHES THICK

A. All concrete shall be thoroughly consolidated by means of mechanical vibrators. Vibrators shall be in accordance with ACI 309.
B. Use internal mechanical vibrators with 7000 rpm minimum frequency operated in nearly vertical position, vibration points uniformity spaced, close enough to assure complete consolidation, and at no time over twice the radius over which vibration is visibly effective. Vibration should continue until:
   1. Frequency returns to normal.
   2. Surface appears liquefied, flattened, and glistening.
   3. Trapped air ceases to rise.
   4. Coarse aggregate has blended into surface, but has not disappeared.
C. Penetrate vibrator head into upper portion of underlying plastic layer. Do not over-vibrate so as to cause segregation.
D. Vibrate around reinforcement, embedded items, and into corners and angles of forms by spading and rodding to exclude rock-pockets, air bubbles and honeycomb. Never have the vibrator more than 3 feet from the point of discharge into the form.
E. This mid-range slump concrete will require only 1/2 of the vibration time of 3 inch slump concrete, while high-range slump will require 1/3 of the vibration time of 3 inch slump concrete.

3.6 CONSOLIDATION OF SLABS LESS THAN EIGHT- INCHES THICK

A. Use vibrating screed.
B. Use of a “jitterbug” is not allowed unless concrete slump is less than 2 inches.

3.7 BONDING CONCRETE

A. Apply bonding agent to existing hardened concrete where noted to be bonded to new concrete. Be sure bonding agent is still tacky at the time of placement of new concrete. Prepare surface and install per manufacturer’s instructions.

3.8 JOINTS

A. Construction Joints:
   1. Locate where indicated on Drawings.
   2. Make joints perpendicular to principal reinforcement.
   3. Unless indicated otherwise, provide longitudinal keys 1 and 1.5 inches minimum depth in walls.
   4. Where concrete is to be exposed in finished construction, install rustication strips in formwork to form straight joint line.

B. Isolation Joints:
   1. Unless indicated otherwise, place isolation joints where exterior slabs abut concrete walls, the building perimeter, and other fixed objects abutting or within the slab area.
   2. Provide non-extruding filler where sealant is indicated. Allow 1/2 inch for application of sealant.
   3. Provide asphalt impregnated filler where sealant is not to be used.
   4. Do not extend reinforcement through joint, except as shown on structural drawings.
   5. Sealants are specified in Section 07920.
C. Contraction Joints:
   1. Make joints straight perpendicular or parallel to building lines and slab edges, as appropriate.
   2. Contraction joints shall be saw cut, unless indicated otherwise. Cut as soon as possible after concrete placement without dislodgment or damage to the slab surface, using test cuts as soon as the concrete will not be damaged by traffic.
   3. Contraction joints shall penetrate the slab a minimum 1/4 the thickness of the slab and shall be 3/16 inches in width minimum.
   4. Align joints with column lines when ever possible. Joints shall form squares where possible or rectangular panels with the long side less than 1-1/2 times the length of the short side. Provide circular or diamond shaped joint lines around columns. Locate contraction joints at reentrant corners. Coordinate with placement of joints in tile surface.
   5. If joint pattern is not shown on Drawings, or joint plan is not submitted for approval to Engineer, maximum distance between joints shall be 20 feet on center, unless other wise noted in plan.
   6. Fill interior joints as indicated on Drawings with specified joint filler at least 90 days after concrete placement.
D. Expansion Joints
   1. Place expansion joints where noted in plan
   2. Expansion joints shall be formed with straight parallel to building lines and slab edges as appropriate and reinforced as per plan.
   3. Joints shall be filled with compressible sealant as specified in Section 07920 and as indicated on Drawings.

3.9 FINISHING OF FORMED SURFACES

A. Finish surfaces within 96 hours after removal of forms, allowing minimum of 24 hours for curing. After removal of forms and immediately following any required repair and patching finish formed surfaces with one or more of the following finish operations
   1. Form Tie Holes: Do not fill form tie holes, except as required for application of waterproof membrane and/or interior finishing.
   2. As-cast Finish: Completely remove all surface fins by hand or power grinding; with stone to approved smoothness. Clean with light wire brushing.

3.10 FINISHlNG OF FLOOR SLABS

A. General:
   1. Finish floor slabs in accordance with ACI 301.
   2. Screed all slabs, for whatever finish, to true levels or slopes work surfaces only to the degree required to produce the desired finish. Do no finishing in areas where water has accumulated; drain and re-screed, do not use cement and sand sprinkling to absorb moisture. Carefully finish all joints and edges with proper tools.

3. Consolidate placed concrete preferably with power driven floats of impact type use wood floats for surfaces inaccessible to power floats
4. In areas where drains are indicated, without depressed slab to accommodate subsequent thick bed setting system or leveling course, slope slabs evenly to drains, 1/8 inch per foot in the area within 8 feet of the drain, unless otherwise indicated.
5. Steel trowel finish only those slab surfaces scheduled to remain exposed in the finished work, and slab surfaces to receive resilient flooring, carpeting, ceramic or quarry tile or other final finish. Grind smooth, surface defects that would telegraph through applied floor covering.
6. Apply trowel and fine broom finish to slab surfaces to be covered by thinset terrazzo, or ceramic or quarry tile that is to be installed with thinset mortar.
7. Provide medium broom finish to concrete stair treads, loading docks, ramps and pedestrian areas subject to foot traffic to provide a nonslip finish.
8. Slabs with excessive shrinkage cracks, curling, and slabs not properly sloped to drains, shall be removed and replaced with complying work, at no additional cost to Owner.

B. Tolerance: Provide floor tolerances as follows, when measured in accordance with ACI 301 and ACI 117, including those floors to receive subsequent finishes.
1. Interior Slabs in equipment areas: Class B 1/4 inch in 10 feet.
2. Interior Areas Indicated For Slopes And Pitches To Drain: Class B 1/4 inch in 10 feet.
3. Exterior Areas Indicated For Slopes And Pitches To Drain: Class B 1/4 inch in 10 feet.
4. Dried slabs shall not show curling at the corners of more than 1/8 inch when measured by a 2 foot straight edge placed in any direction.

3.11 SITE ENVIRONMENTAL PROCEDURES

A. Waste Management: Construction Waste Management and as follows:
1. Formwork: Reuse forms to greatest extent possible without damaging structural integrity of concrete and without damaging aesthetics of exposed concrete.
2. Mixing equipment: Return excess concrete to supplier; minimize water used to wash equipment.
3. Moisture curing: Prevent water run-off.
4. Hardened, cured waste concrete: Hardened, cured waste concrete may be used as aggregate in concrete mix if approved by Engineer.

3.12 CURING AND PROTECTION

A. General:
1. Protect all freshly placed concrete from premature drying. Maintain curing procedures used for three days, at temperatures above 70 degrees F. If mean daily temperature drops below 70 degrees F. during this period, extend curing period appropriately to 5 days.
2. Field application of curing compound shall be 2 coats, one as soon as finishing is complete and the second the next morning in accordance with recommendations of the product manufacturer, but not at a rate in excess of 300 sq. ft per gallon.
3. Protect all concrete during curing period from all damaging; mechanical disturbances, load stresses, heavy shock and excessive vibration.
4. Protect finish surfaces from all damage.
5. Leave curing compound on slab for a minimum of 7 days.
6. If curing compound later requires removal within 3 weeks of application, strip following the procedures recommended by manufacturer, for all slab areas that require coatings or tile.

3.13 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 1.7 Inspection Services
B. Provide free access to Work and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
D. The Owner may perform tests of cement and aggregates to ensure conformance with specified requirements.
E. Take four concrete test cylinders for every 150 cu yards or less of each class of concrete placed.
F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. Take one slump test for each set of test cylinders taken.

3.14 PATCHING

A. General: Defective concrete and honeycombed areas as determined by Engineer shall be repaired as specified in Section 03700.
B. Upon removal of forms, remove plugs and break off metal ties. Where form ties are to be filled promptly fill holes upon stripping as follows:
    1. Moisten holes with water, brush on a coat 1/16 inch of neat cement slurry mixed to consistency of paste. Plughole with a 1 to 1.5 mixture of cement and concrete sand, mixed to a slightly damp to the touch consistency. Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form. Trowel smooth with heavy pressure, and avoid burnishing.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner shall employ a testing laboratory to perform tests and submit test reports. Testing lab shall furnish all equipment for taking and testing concrete samples. Sampling and testing of concrete shall be performed by ACI certified Concrete Field Technicians Grade 1.
B. Sampling Fresh Concrete: Shall conform to ASTM C 172 and ASTM C 94 except as modified here.
    1. Slump: ASTM C 143. One test at point of discharge for each class of concrete during the days placement, and one every additional 50 yards of each class of concrete. Additional tests should be taken if consistency of concrete changes.
    2. Concrete and Ambient Temperature: Performed each time concrete compressive strength cylinders are cast per ASTM C-1064.
    3. Compressive Test Specimens: ASTM C 31. One set of 5 cylinders for each compressive strength test taken at same frequency as slump test. Do not store cylinders in the field over 24 hours until picked up and then placed into laboratory curing conditions.
    4. Compressive Strength Tests: ASTM C 39. Test one specimen at 3 days, test one specimen at 7 days, 2 cylinders at 28 days and one specimen for 56 days if the average of the (2) 28 day cylinders strength is less than required compressive strength.
    5. Test results will be reported in writing to Architect, Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests are completed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the

structure, design strength at 28 days, compressive strength, type of break, ambient and concrete temperature.

6. Additional tests: The testing lab will make additional tests of in-place concrete when test results indicate specified compressive strength and other characteristics have not been attained. Engineer will direct location and type of testing to be conducted. Costs of testing to be paid by contractor. Strength evaluations of structure and testing of in place concrete shall be per ACI 318.

3.16 DEFECTIVE CONCRETE

A. Defective concrete is concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. A/E shall determine the repair or replacement of defective concrete.
C. Do not patch, fill, touch-up, repair or replace-exposed concrete except upon express direction of A/E for each individual area.

END OF SECTION

SECTION 03 35 00
CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Finishing separate floor toppings, slabs-on-grade, and monolithic floor slab.
   2. Surface treatment with concrete hardener, sealer, and slip resistant coatings.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings
B. ACI 302 - Guide for Concrete Floor and Slab Construction
C. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 Submittals Procedures.
B. Product Data: Provide data on concrete hardener, sealer, and slip resistant treatment, compatibilities, and limitations.

1.5 MAINTENANCE DATA

A. Submit under provisions of Section 01 77 00 Contract Closeout.
B. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 and ACI 302.
B. Maintain copies of each document on site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Section 01 31 00 Project Management and Coordination.
B. Deliver materials in manufacturer's packaging including application instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Temporary Lighting: Provide minimum 200 W light source, 8' above the floor surface, for each 425 sq. ft. of floor being finished.

B. Temporary Heat: Ambient temperature of 50° F (10° C) minimum.
C. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.9 COORDINATION

A. Coordinate work under provisions of Section 01 31 00 Project Management and Coordination.
B. Coordinate the work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 COMPOUNDS - HARDENERS AND SEALERS

A. Non-Metallic Hardener: Premixed, dry powder, colored, emery aggregate and abrasion resistant hardener.

2.2 SLIP RESISTANT TREATMENT

A. Slip Resistant Finish: Aluminum oxide type, color as selected from manufacturer's standard range

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00 Project Management and Coordination.
B. Verify that floor surfaces are acceptable to receive the work of this section.

3.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.
B. Wood-float surfaces that will receive quarry tile, ceramic tile, cementitious terrazzo with full bed setting system.
C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set quarry tile, and thin set ceramic tile.
D. Steel trowel surfaces scheduled to be exposed.
E. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.

3.3 FLOOR SURFACE TREATMENT

A. Apply dry shake liquid hardener in accordance with manufacturer's instructions as scheduled.
B. Apply slip resistant finish in accordance with manufacturer's instructions as scheduled.
C. Apply sealer in accordance with manufacturer's instructions as scheduled.

3.4 TOLERANCES

A. Measure for F_F and F_L tolerances for floors in accordance with ASTM E1155, within 72 hours after slab installation
B. Finish concrete to achieve the following tolerances:
   1. Under Ceramic or Quarry Tile on Setting Bed: F_F 25 and F_L 25

2. Under Resilient flooring (VCT, sheet vinyl, etc): F_F 30 and F_L 25
3. Exposed to View and Foot Traffic (polished concrete): F_F 40 and F_L 35
4. Exposed stained concrete (mechanical, electrical, custodial): F_F 20 and F_L 15
5. Exception: The F_L levelness tolerances do not apply to any un-shored elevated construction.
6. Correct the slab surface if the actual F_F or F_L number for the floor installation measures less than required.

C. Identify areas requiring corrective work.
1. Correct all defects in the defined traffic floor by grinding or removal and replacement of the defective work.
2. Re-measure corrected areas by the same process.

END OF SECTION

SECTION 03 41 00
STRUCTURAL PRECAST CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Lintels and bond beams.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings
B. ACI 318 - Building Code Requirements for Structural Concrete
C. ASCE-7 – Minimum Design Loads for Building & Other Structures
D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
F. ASTM A185 - S Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
G. ASTM A416 - Steel Strand, Uncoated Seven-Wire (Stress-Relieved) for Pre-stressed Concrete
H. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
J. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate and Flat Bar
K. ASTM C150 - Standard Specification for Portland Cement
L. AWS D1.1/D1.1M - Structural Welding Code Bundled Set B
M. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel
N. PCI MNL-116 - Manual for Quality Control for Plants and Production of Pre-cast Concrete Products
O. PCI MNL-120 – PCI Design Handbook – Pre-cast and Pre-stressed Concrete
P. PCI MNL-123 - Design & Typical Details of Connections for Pre-cast & Pre-stressed Concrete
Q. PCI MNL-124 - Design for Fire Resistance of Pre-cast Concrete
R. FBC - Florida Building Code
S. UL - Underwriter's Laboratories

1.4 DESIGN REQUIREMENTS

A. Size the components to withstand design loads.
B. Maximum Allowable Deflection: In accordance with FBC and ACI 318

C. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.
D. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.
E. Calculate structural properties of framing members in accordance with FBC, and ACI 318.
F. Design and construction shall comply with FBC, ASCE 7-Wind Loads.
G. Superimposed design dead loads on roofs shall be the actual dead loads of the system, roofing, MEP allowance, plus 5-psf for re-roofing.

1.5 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings and relationship to adjacent materials, and sealed by a Professional Structural Engineer licensed in the State of Florida. Indicate design loads, deflections, cambers, bearing requirements and special conditions.
C. Product Data: Indicate standard component configurations, design loads, deflections, cambers and bearing requirements.

1.6 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 - Submittals Procedures
B. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.
C. Provide a visual record of surrounding structures outside of school property at construction projects requiring driven piles.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with the requirements of PCI MNL-116, PCI MNL-123, and PCI MNL-120.
B. Fabricator: Company specializing in manufacturing the work of this section with minimum five years documented experience.
C. Erector: Company specializing in erecting the work of this section with three years documented experience and approved by manufacturer.
D. Design pre-cast concrete members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
E. Welder: Person qualified within previous 12 months in accordance with AWS D1.1 and AWS D1.4.

1.8 REGULATORY REQUIREMENTS

A. Conform to ACI 318 and applicable code for design load and construction requirements applicable to work of this section.
B. Conform to UL Assembly to achieve hour fire rating for floor or roof assembly.

1.9 PRE-INSTALLATION MEETING

A. Convene a pre-installation conference two weeks prior to commencing work of this section, under provisions of Section 01 31 00.
B. Instruct others when field cutting of required openings are 10: and smaller.

1.10 DELIVERY, STORAGE AND PROTECTION

A. Section 01 60 00 - Product Requirements
B. Handle pre-cast members in position consistent with their shape, design, and Engineer's requirements.
   1. Lift and support only from support points.
C. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
D. Protect members to prevent staining, chipping or spalling of concrete.
E. Mark each member with date of production and final position in structure.

1.11 PROJECT CONDITIONS

A. Section 01 31 00 – Project Management and Coordination.
B. Coordinate the work of framing components not pre-tensioned but associated with the work of this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: White or Gray Portland, conforming to ASTM C150 Type I or III.
B. Aggregate, Sand, Water, and Admixtures, Pre-cast Fabricator determined as appropriate to design requirements and PCI MNL-116.

2.2 REINFORCEMENT

A. Tensioning Steel Tendons: ASTM A416 Grade 250K or 270K, of sufficient strength commensurate with member design
B. Reinforcing Steel: ASTM A615/A615M Grade 60 deformed steel bars.
C. Welded Steel Wire Fabric: ASTM A185 Plain Type, ASTM A497 Welded Deformed Type, and ASTM A497 Deformed Type in flat sheets galvanized.
D. Coating: Galvanize reinforcement to resist corrosion.

2.3 ACCESSORIES

A. Connecting and Supporting Devices:
   1. ASTM A36 carbon steel plates, angles, items cast into concrete inserts, hot-dip galvanized in accordance with ASTM A153.
   2. Do not paint surfaces in contact with concrete or surfaces requiring field welding.
B. Grout: Non-shrink, non-metallic, non-ferrous minimum yield strength of 10,000 psi at 28 days.
C. Bearing Pads: High-density plastic, smooth both sides, Vulcanized elastomeric compound molded to size, Neoprene.

D. Bolts, Nuts and Washers: High strength steel type recommended for structural steel joints.
E. Prime Paint: Zinc rich alkyd type.

2.4 FABRICATION

A. Fabrication procedure to conform to PCI MNL-116
B. Maintain plant records and quality control program during production of pre-cast members and make records available upon request.
C. Ensure reinforcing steel, anchors, inserts, plates, angles and other cast-in items are embedded in the locations as shown on shop drawings.
D. Tension reinforcement tendons as required to achieve design load criteria.
E. Provide required openings with a dimension larger than 10-inches and embed accessories provided by other sections, at indicated locations.
F. Exposed Ends at Stressing Tendons: Fill recess with ~~[non-shrink]~~ epoxy grout, trowel flush.

2.5 FINISHES

A. Ensure exposed-to-view finish surfaces of pre-cast concrete members are uniform in color and appearance.
B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
C. Rubbed Finish: Surface holes or bubbles over 1/4 inch filled with matching cementitious paste, fins or protrusions removed and surface ground smooth, surface then rubbed with neat cementitious paste to smooth and even color and texture.

2.6 FABRICATION TOLERANCES

A. Conform to PCI MNL-116.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Control: Provide mix design for concrete.
B. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.1 APPLICATION

A. Verify that site conditions are ready to receive work and field measurements are as shown on shop drawings.

3.2 PREPARATION

A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.3 ERECTION

A. Erect members without damage to structural capacity, shape, or finish.
   1. Replace or repair damaged members.

B. Align and maintain uniform horizontal and vertical joints, as erection progresses.
C. Protect members from staining by maintaining temporary bracing until final placement of all supports.
D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.
E. Adjust differential camber between precast members to tolerance before final attachment.
F. Install bearing pads.
G. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12
H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.
I. Grout underside of column and beam bearing plates and joints between members at roof and floor locations.
J. Secure units in place and perform welding in accordance with AWS D1.1.

3.4 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Control: Tolerances
B. Erect all members' level and plumb within allowable tolerances.
C. Conform to PCI MNL-116.
D. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise Architect/Engineer.
    1. Execute modifications as directed.

3.5 PROTECTION

A. Protect members from damage caused by field welding or erection operations.
B. Provide non-combustible shields during welding operations.

3.6 CLEANING

A. Clean weld marks, dirt or blemishes from surface of exposed members.

END OF SECTION

DIVISION 4 MASONRY

SECTION 04 05 13
MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Mortar for Masonry
   2. Grout for Unit Masonry

1.3 REFERENCES

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures
B. ACI 530.1/ASCE 6/TMS 602 - Specifications for Masonry Structures
C. ASTM C91 - Standard Specification for Masonry Cement
D. ASTM C94/C94M- Standard Specification for Ready-Mixed Concrete
E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
F. ASTM C150 - Standard Specification for Portland Cement
G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
H. ASTM C270 - Standard Specification for Mortar for Unit Masonry
I. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
J. ASTM C476 - Standard Specification for Grout for Masonry
K. ASTM C595 - Standard Specification for Blended Hydraulic Cement
L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
M. ASTM C1019 - Standard Test Method of Sampling and Testing Grout
N. FBC - Florida Building Code

1.4 SUBMITTALS

A. Submit mix design for mortar indicating whether to use the proportion or the property specification of ASTM C270.
B. Submit mix design for grout indication conformance of grout to requirements of ASTM C476.
C. Submit test reports indicating conformance of mortar materials to property specifications of ASTM C270.
D. Submit test reports of pre-construction tests of mortar for consistency, mortar aggregate ratio, water content, air content, compressive strength, and splitting tensile strength in conformance with ASTM C780.
E. Submit test reports of grout tests in conformance to ASTM C1019.
F. Submit manufacturer's certificate for products indicating conformance with specified requirements.
G. Submit two samples representative of mortar color.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original unopened containers and store in dry weather-tight enclosures.
B. Stockpile and handle aggregates to prevent segregation and contamination.
C. Maintain sand for volume proportioning of mortar and grout in a damp loose condition.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Follow requirements of ACI530.1/ASCE6/TMS 602 for cold and hot weather construction.

PART 2 PRODUCTS

2.1 MORTAR MATERIALS

A. Cementitious Materials:
   1. Masonry Cement: ASTM C91, Type M or S, gray color
   2. Portland Cement: ASTM C150, Type I, gray color
   3. Hydrated Lime: ASTM C207, Type S
B. Sand: ASTM C144
C. Water: Provide water suitable for drinking, clean, and free of harmful amounts of acid, alkalies, salts, or organic materials.
D. Admixtures:
   1. When required use only non-chloride based accelerators as approved by specifier.
   2. Do not add antifreeze substances to the mortar.
E. Pigments: When required used mineral oxide pigments not to exceed 5% of the weight of masonry cement or 10% of the weight of Portland Cement in the mortar.

2.2 GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I
B. Hydrated Lime: ASTM C207, Type S
C. Aggregates: ASTM C404
D. Water: Provide water suitable for drinking, clean, and free of harmful amounts of acid, alkalies, salts, or organic materials.

2.3 MORTAR MIXES

A. Mortar: Provide ASTM C270, type ‘M’ or type ‘S’ in conformance with proportion specifications.

2.4 GROUT MIXES

A. Grout: ASTM C476, coarse grout meeting proportion requirements

2.5 MORTAR MIXING

A. Measure sand by volume or equivalent weight; do not measure by shovel.
B. In clean mortar mixer, mix ingredients for 3 to 5 minutes with maximum amount of water to produce proper workability.
C. Re-temper mortar as needed within 2½-hours after initial mixing.

D. Discard unused mortar 2½-hours after initial mixing.

2.6 GROUT MIXING

A. Control batching procedure to ensure proper volume proportions of grout materials and achieve grout slump between 9" and 11".
B. Mix grout in accordance with ASTM C94.
C. Measure grout materials mixed at job site by volume and mix all ingredients in mechanical mixer for minimum of five minutes.

2.7 MIX TESTS

A. Testing of Mortar: In accordance with ASTM C270
B. Testing of Grout: In accordance with ASTM C1019

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar and grout in accordance with ACI 530.1/ASCE 6/TMS 602.

3.2 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 Quality Control.
B. Test Mortar in accordance with ASTM C780 for consistency, mortar aggregate ratio, water content, air content, compressive strength, and splitting tensile strength.
C. Test Grout in accordance with ASTM C1019

END OF SECTION

SECTION 04 20 00
MASONRY UNIT

PART I GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Concrete masonry and brick
   2. Reinforcement, anchorage, and accessories

1.3 REFERENCES

A. ASCE 7 – American Society of Civil Engineers – Wind Loads
B. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures
C. ACI 530.1 /ASCE 6/TMS 602 – Specifications for Masonry Structures
D. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
E. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products
F. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
G. ASTM A525 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
H. ASTM A580/A580M – Standard Specification for Stainless and Heat-Resisting Steel Wire
I. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
J. ASTM A641/A641M – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
K. ASTM B370 – Standard Specification for Cooper Sheet and Strip for Building Construction
L. ASTM C34 – Standard Specification for Structural Clay Load-Bearing Wall Tile
M. ASTM C55 – Standard Specification for Concrete Building Brick
N. ASTM C56 – Standard Specification for Structural Clay Non-Load Bearing Tile
O. ASTM C62 – Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
P. ASTM C73 – Standard Specification for Calcium Silicate Face Brick (Sand-Line Brick)
Q. ASTM C90 – Standard Specification for Load-Bearing Concrete Masonry Units
R. ASTM C126 – Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units
S. ASTM C129 – Standard Specification for Non-Load Bearing Concrete Masonry Units
T. ASTM C212 – Standard Specification for Structural Clay Facing Tile
U. ASTM C216 – Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
V. ASTM C315 – Standard Specification for Clay Flue Linings
W. ASTM C530 – Standard Specification for Structural Clay Non-Load Bearing Screen Tile

X. ASTM C652 – Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
Y. ASTM C744 – Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units
Z. IMIAC – International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Units
AA. IMIAC – International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Hot Weather Masonry Construction
BB. UL – Fire Resistance Directory
CC. FBC – Florida Building Code

1.4 SUBMITTALS

A. Submit under provision s of Section 01 33 00.
B. Product Data: Provide data for masonry units and fabricated wire reinforcement.
C. Samples: Submit four samples of decorative block, face brick, pre-faced, units to illustrate color, texture and extremes of color range.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Design and construction shall comply with ASEC 7 Wind Loads, FBC, ACI 530/ASCE 5/TMS 402, and ACI 530.1/ASCE 6/TMS 602
B. Conform to applicable code for UL Assembly requirements for fire-rated masonry construction.
C. Provide lateral support for block walls, both vertical and horizontal.
    1. The vertical heights of masonry between horizontal supports shall be in accordance with the wall lateral support requirements, FBC table 2107.1.

1.7 MOCK-UP

A. Provide mock-up of composite masonry under provisions of Section 01 40 00.
B. Construct a masonry wall into a panel sized 5' long by 4' high, which includes a corner, mortar, and accessories, structural backup, wall openings, flashings, wall insulation, air barrier, vapor barrier and parging.
C. Locate where directed.
D. Mock-up to remain intact and protected until the Punch List is completed or until Owner agrees in writing to removal.
E. Mock-up may remain as part of the work with the Owner's approval.

1.8 PRE-INSTALLATION CONFERENCE

A. Meet one week prior to commencing work of this section, under provisions of Section 01 31 00.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: IMIAC – Recommended Practices and Guide Specifications for Cold Weather Masonry Construction
B. Hot Weather Requirements: IMIAC – Recommended Practices and Guide Specifications for Hot Weather Masonry Construction

1.11 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate the masonry work with installation of window anchors.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Load-Bearing Concrete Masonry Units (CMU): ASTM C90, Type II – Non-Moisture Controlled
B. Hollow Non-Load Bearing Block Units (CMU): ASTM C129, Type II – Non-Moisture Controlled
C. Concrete Brick Units: ASTM C55, Grade N, Type II – Non-Moisture Controlled of same Type and Weight as block units
D. Provide special units for 90° corners, bond beams, lintels, coved bases, bull nosed corners and angle corners.
E. All block installed if fire-rated walls and partitions shall be classified units or certified for the intended use in accordance with FBC.

2.2 BRICK UNITS

A. Face Brick: ASTM C216, Type FBS, Grade MW; color as selected
B. Building Brick: ASTM C62, Grade NW; solid units
C. Hollow Facing and Building Brick: ASTM C652, Grade SW, Type HBS; color as selected
D. Sand-Lime Face Brick: ASTM C73, Grade SW
E. Size and Shape: Provide special units for 90° corners, lintels, bull nosed corners and angle corners.
F. Special Brick Shape: Shaped to profile indicated; surface texture on exposed sides and ends.
G. Giant Face Brick: ASTM C216, Type FBS, Grade MW; color as selected
H. Giant Hollow Facing and Building Brick: ASTM C652, Grade SW, Type HBS; color as selected
I. Provide special units for 90° corners, lintels, bull nosed corners and angle corners.
J. Special Giant Brick Shape: Shaped to profile indicated; surface texture on sides and ends.

2.3 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: Ladder type; steel wire, hot dip galvanized to ASTM A641/A641M Class 3 after fabrication, 3/16" side rods with 9-gauge crossties.

B. Multiple Wythe Joint Reinforcement: Ladder type; with moisture drip; adjustable type, steel wire, hot dip galvanized ASTM A641/A641M Class 3 fabrication, 3/16" side rods with 9-gauge crossties.
C. Reinforcing Steel: ASTM A615/A615M/ Grade 40 and 60, deformed carbon bars, unfinished.
   1. Strap Anchors: Bent steel shape, hot dip galvanized to ASTM A123/A123M, B2 finish.
D. Wall Ties: Corrugated formed sheet metal, gauge thick, adjustable, hot dip galvanized to ASTM A123/A123M B2 steel finish.
E. Wall Ties: Formed steel wire, gage thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A123/A123M B2 steel finish.
F. Dovetail Anchors: Bent steel strap, galvanized to ASTM A123/ASTM 123M B2 finish.

2.4 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04 05 13.

2.5 FLASHINGS

A. Copper: ASTM B350, cold-rolled; 20 oz/sq ft, 0.027" thick; natural finish
B. Galvanized Steel: ASTM A525, G90 finish, 24-guage core steel
C. Stainless Steel: ASTM A167, Type 304, soft temper; 24-gauge thick; smooth finish
D. Provide dovetail, saw tooth, or other design to develop all direction bonding
E. Lap Sealant: Butyl type as specified in Section 07 92 00

2.6 ACCESSORIES

A. Performed Control Joints: Neoprene material with corner and tee accessories, cement fused joints
B. Joint Filler: Closed cell polyvinyl chloride; oversized 50% to joint width; self-expanding.
C. Cavity Wall Drainage System: High-density polyethylene to support mortar droppings and debris within the cavity.
D. Building Paper: No. 30 asphalt saturated felt.
E. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
F. Weep: Preformed plastic tubes, hollow
G. Cavity Vents: Molded polyvinyl chloride grilles, insect resistant.
H. Cleaning Solutions: Non-acidic, not harmful to masonry work or adjacent materials

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 COURSING

A. Establish lines, levels, and coursing indicated.
   1. Protect from displacement.
B. Maintain masonry courses to uniform dimension.
   1. Provide vertical and horizontal joints of uniform thickness.
C. Concrete Masonry Units:
   1. Coursing: One unit and one mortar joint to equal 8"
   2. Mortar Joints: Concave
D. Brick Units:
   1. Coursing: Three units and three mortar joints to equal 8"
   2. Mortar Joints: Concave

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Do not butter corners of joints or excessively furrow mortar joints.
D. Remove excess mortar as work progresses.
E. Interlock intersections and external corners.
F. Do not shift or tap masonry units after mortar has achieved initial set.
   1. To make an adjustment, remove mortar and replace.
G. To prevent broken masonry unit corners or edges perform jobsite cutting of masonry units with proper tools to provide straight, clean, un-chipped edges.
H. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, cavity insulation vapor barrier adhesive or bitumen damp proofing is applied.
I. Isolate masonry partitions from vertical structural framing members with a control joint.
J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 WEEPS

A. Install weeps in veneer at intervals recommended by the Brick Institute of America.

3.6 CAVITY WALL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps. Provide a system of high-density polyethylene strands woven to a mesh to collect mortar dropping and permanently suspend them above the weeps.
B. Build inner wythe ahead of outer wythe to receive cavity insulation air/vapor barrier adhesive.

3.7 REINFORCEMENT AND ANCHORAGES – SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in 1st and 2nd joints above and below openings. Extend minimum 16" each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 8".

E. Reinforce stack-bonded unit, joint corners, and intersections with strap anchors 16" o.c.
F. All masonry below grade is to be grouted solid.
   1. Provide footing/wall dowels.
   2. Measure the splice length from the finish floor.

3.8 REINFORCEMENT AND ANCHORAGES – VENEER MASONRY

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in 1st and 2nd horizontal joints above and below openings.
   1. Extend minimum 16" each side of opening.
C. Place joint reinforcement ends minimum 6".
D. Lap joint reinforcement ends minimum 8".
E. Embed wall ties in masonry back up for bonding veneer at maximum 16" o.c. vertically and 36" o.c. horizontally.
   1. Place maximum 3" o.c. each way around perimeter of openings, within 12" of openings.
F. Secure wall ties, rods, strap, anchors to back-up and embed into masonry veneer at maximum 16" o.c. vertically, and 36" o.c. horizontally.
G. Place at maximum 3" o.c. each way around perimeter of openings, within 12" of openings.
H. Provide length to extend a minimum of 1½" into the exterior wythe.

3.9 REINFORCEMENT AND ANCHORAGES – CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in 1st and 2nd horizontal joints above and below openings.
   1. Extend minimum 16" each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 8".
E. Embed anchors in concrete or attached to structural steel members.
   1. Embed anchorages in every second block or sixth brick joint.
   2. Provide length to extend a minimum 1½" into the exterior wythe.
F. Reinforce stack bonded unit joint corners and intersection with strap anchors 16" o.c.

3.10 REINFORCEMENT AND ANCHORAGES – MULTIPLE WYTHE UNIT MASONRY

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in 1st and 2nd horizontal joints above and below openings.
   1. Extend minimum 16" each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 8".
E. Support and secure reinforcing bars from displacement.
   1. Maintain position within ½" of dimensioned position.
F. Embed anchors embedded in concrete or attach to structural steel members.
   1. Embed anchorages in every second block or sixth brick joint.
G. Provide length to extend a minimum 1½" into the exterior wythe.
H. Reinforce stack bonded unit joint corners and intersection with strap anchors 16" o.c.

3.11 MASONRY FLASHINGS

A. Provide through wall flashing under parapet copings, for counter-flashing in masonry walls, where roofs abut, at lintels of exterior wall openings, ledge or shelf angles, under windowsills and band courses, at spandrel beams, foundation walls and where shown on drawings.
B. Turn flashing up minimum 8" and bed into mortar joint of masonry, seal to concrete, and seal to sheathing over framed back up.
C. Lap end joints minimum 6" and seal watertight.
D. Turn flashing, fold and seal at corners, bends and interruptions to form dams.

3.12 SILLS

A. See specification Section 08 51 13 – 3.1 B Sill & Bucks for windowsill requirements.

3.13 LINTELS

A. Install lintels over openings.
B. Install reinforced unit masonry lintels over openings where steel or pre-cast concrete lintels area not scheduled.
C. Openings up to 42" Wide: Place one, No. 5 reinforcing bar 1" from bottom web
D. Openings from 42": Up to 78" wide:
   1. Place two, No. 5 reinforcing bars 1" from bottom web.
E. Opening over 78": Reinforce openings as detailed.
F. Do not splice reinforcing bars.
G. Support and secure reinforcing bars from displacement.
   2. Maintain position within ½" of dimensioned position.
H. Place and consolidate grout fill without displacing reinforcing.
I. Allow masonry lintels to attain specified strength before removing temporary supports.
J. Maintain bearing on each side of opening. Minimum bearing of 8" on masonry

3.14 ENGINEERED MASONRY

A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
B. Place mortar in masonry unit bed-joints back ¼" from edge of unit grout spaces, bevel back and upward.
   1. Permit mortar to cure seven days before placing grout.
C. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated.
D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters.
E. Grout space dimension is the clear dimension between any masonry protrusions and increases by diameters of the horizontal bars within the cross-section of the grout space.
F. Wet masonry unit surfaces in contact with grout just prior to grout placement.
G. The minimum grouted spaces in both horizontal dimensions shall be as follows:
   1. Low-Lift Grouted Construction
      a. Fine aggregate: Grout spaces may be less then 2".
      b. Fine or coarse aggregate: Grout spaces shall be 2" or more.
   2. High-Lift Grouted Construction:
      a. Fine or coarse aggregate: Grout space shall not be less than 2" wide.
H. The area of vertical reinforcement shall not exceed 6% of the area of the grout space.

I. When grouting is stopped for more than one hour, terminate grout 1½" below top of upper masonry unit to form a positive key for subsequent grout placement.
J. Low Lift Grouting – Place first lift of grout to a height of 16" and rod for grout consolidation.
   1. Place subsequent lifts in 8" increments and rod for grout consolidation
K. High Lift Grouting:
   1. Provide cleanout opening no less than 4" high at the bottom of each cell to be grouted by cutting one face shell of masonry unit.
   2. In double wythe walls, omit every second masonry unit in one of the wythes for clean out and cell inspection purposes.
   3. In double wythe walls, construct vertical grout barriers or dams between the masonry wythes, with masonry units every 25' maximum.
   4. Clean out masonry cells and cavities with high-pressure water spray before pouring or pumping grout.
      a. Allow the complete water drainage and use compressed air to remove debris.
   5. Contractor shall request inspection of the cells and cavities before concealing them.
      a. Allow three days advance notice of inspection.
   6. After cleaning and cell inspections, seal openings with masonry units.
   7. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
   8. Limit grout lift to 48" and rod for grout consolidation. Wait 30 to 60 minutes before placing next lift.

3.15 CONTROL AND EXPANSION JOINTS

A. Provide expansion joints and control joints to prevent uncontrolled stress cracks in the structure and according to the engineering's plans and standards.
B. Do not continue horizontal joint reinforcement through control and expansion joints.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Size control joint in accordance with Section 07 92 00 for sealant performance.

3.16 BUILT-IN WORK

A. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
B. Install built-in items plumb and level.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints.
   1. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12" from framed openings.
D. Do not build in organic materials subject to deterioration.

3.17 TOLERANCES

A. Maximum Variation from Alignment of Columns: Pilasters: ¼"
B. Maximum Variation from Unit to Adjacent Unit: 1/32"
C. Maximum Variation from Plane of Wall: ¼" in 10' and ½" in 20' or more
D. Maximum Variation from Plumb: ¼" per story non-cumulative and ½" in two stories or more
E. Maximum Variation from Level Coursing: ⅛" in 3', ¼" in 10'; and ½" in 30'
F. Maximum Variation of Joint Thickness: ⅛" in 3'

G. Maximum Variation from Cross-Section Thickness of Walls: ¼"

3.18 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds.
   1. 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 PARGING

A. Dampen masonry walls prior to parging.
B. Scarify each parging coat to ensure full bond to subsequent coat.
C. Parge masonry walls in two uniform coats of mortar to a total thickness of ¾" minimum.
D. Steel trowel surface smooth and flat with a maximum surface variation of ⅛" per foot.
E. Strike top edge of parging at 45°

3.20 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 Quality Control.

3.21 CLEANING

A. Clean work under provisions of 01 77 00, and comply with ASTM, BIA, and ACI 530.
B. Remove excess mortar and mortar smears as work progresses.
   1. Mortar streaks and/or stains that cannot be removed by light cleaning shall be replaced.
   2. Do not use abrasives for rubbing or scraping off mortar stains.
C. Replace defective mortar and match adjacent work.
D. Clean soiled surfaces with cleaning solution.
   1. Use only cleaning products approved by the Architect and applied in direct conformance with the manufacturer’s instructions.
   2. DO NOT USE Muriatic acid to clean masonry.
E. Use non-metallic tools in cleaning operations.

3.22 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 50 00.
B. Without damaging completed work, provide protective boards at exposed external corners, only at those corners subject to damage due to construction activities.

END OF SECTION

SECTION 04 20 10
REINFORCED MASONRY UNIT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Concrete masonry or brick units
   2. Reinforcement, anchorage, and accessories
   3. Parged masonry surfaces

1.3 REFERENCES

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures
B. ACI 530.1/ASCE 6/TMS 602 - Specifications For Masonry Structures
C. ASCE 7 - American Society of Civil Engineers – Wind Loads
D. ASTM A82 - Standard Specification for Steel Wire for Concrete Reinforcement
E. ASTM A123 - Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
F. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
G. ASTM A525 - General Requirements for Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.
H. ASTM A580/A580M - Standard Specification for Stainless and Heat-Resisting Steel Wire
I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars For Concrete Reinforcement
J. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
K. ASTM B370 - Standard Specification for Cooper Sheet and Strip For Building Construction
L. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile
M. ASTM C55 - Standard Specification for Concrete Building Brick
N. ASTM C56 - Standard Specification for Structural Clay Non-Load Bearing Tile
O. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
P. ASTM C73 - Standard Specification for Calcium Silicate Face Brick (Sand-Line Brick)
Q. ASTM C90 - Standard Specification for Load-Bearing Concrete Masonry Units
R. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
S. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
T. FBC - Florida Building Code
U. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction

V. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Hot Weather Masonry Construction
W. UL - Fire Resistance Directory

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Shop Drawings: Indicate bars sizes, spacing, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement and accessories.
C. Product Data: Provide data for brick and masonry units and fabricated wire reinforcement.
D. Samples: Submit samples of decorative block, brick units to illustrate color, texture, and extremes of color range.
E. Design Data: Indicate required mortar strength, masonry unit assembly strength in all planes with supportive test data.
F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 530 and ACI 530.1.
B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Design and construction shall comply with ASCE 7 – Wind loads, FBC, ACI 530/ASCE 5/TMS 402, and ACI 530.1/ASCE 6/TMS 602.
B. Conform to applicable code for UL Assembly requirements for fire rated masonry construction.
C. Provide lateral support for block walls, both vertical and horizontal.
    1. The vertical heights of masonry between horizontal supports shall be in accordance with the wall lateral support requirements, FBC table 2107.1.

1.8 MOCK-UP

A. Provide mock-up of composite masonry under provisions of Section 01 40 00.
B. Construct a masonry wall panel sized 8' long by 6' high, which includes mortar and accessories, backup, wall openings, flashings, wall insulation, air barrier, vapor barrier, and parging.
C. Locate where directed.
D. Mock-up to remain intact and protected until the Punch List is completed or until Owner agrees in writing to removal.
E. Mockup may not remain as part of the work.

1.9 PRE-INSTALLATION CONFERENCE

A. Meet two weeks prior to commencing work of this section, under provisions of Section 01 31 00.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store, protect, and deliver products to site under provisions of Section 01 60 00.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction
B. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction

1.12 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate the masonry work with installation of window anchors.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Block Units (CMU): ASTM C90, Type II – Non-Moisture Controlled
B. Load Bearing Concrete Masonry Units (CMU): ASTM C90-90, Type II – Non-Moisture Controlled
C. Decorative Block Units (CMU): ASTM C90-90, Type II – Non-Moisture Controlled
D. Concrete Brick Units: ASTM C55, Grade N, Type II – Non-Moisture Controlled of same type and weight as block units
E. All block installed in fire rated walls and partitions shall be classified units or certified for the intended use in accordance with FBC.

2.2 BRICK UNITS

A. Face Brick: ASTM C216, Type FBS, Grade MW; color as selected.
B. Building Brick: ASTM C62, Grade NW; solid units
C. Hollow Facing and Building Brick: ASTM C652, Grade SW, Type HBS; color as selected
D. Sand-Lime Face Brick: ASTM C73, Grade SW
E. Size and Shape: Provide special units for 90° corners, lintels, bull nosed corners and angle corners
F. Special Brick Shape: Shaped to profile indicated; surface texture on sides and ends
G. Giant Face Brick: ASTM C216, Type FBS, Grade MW; color as selected
H. Giant Hollow Facing and Building Brick: ASTM C652, Grade SW, Type HBS; color as selected
I. Provide special units for 90° corners, lintels, bull nosed corners and angle corners
J. Special Giant Brick Shape: Shaped to profile indicated; surface texture on sides and ends

2.3 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: Ladder type; steel wire, hot dip galvanized to ASTM A641/A641M Class 3 after fabrication, 3/16" side rods with 9-ga cross ties.

B. Multiple Wythe Joint Reinforcement: Ladder type; with moisture drip; adjustable type, steel wire, hot dip galvanized ASTM A641/A641M Class 3 fabrication, 3/16" side rods with 9-gauge crossties.
C. Reinforcing Steel: A615/A615M, Grade 60; deformed carbon bars as specified in Section 03 20 00, unfinished
   1. Strap Anchors: Bent steel shape, hot dip galvanized to ASTM A123 B2 finish.
D. Wall Ties: Corrugated formed sheet metal, gauge thick, adjustable, hot dip galvanized to ASTM A123/A123M B2 steel finish.
E. Wall Ties: Formed steel wire, gage thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A123/A123M B2 steel finish.
F. Dovetail Anchors: Bent steel strap, galvanized to ASTM A123/ASTM 123M B2 finish.

2.4 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04 05 13.

2.5 FLASHINGS

A. Copper: ASTM B370, cold rolled; 20 oz/sq ft, 0.027 inch thick; natural finish.
B. Galvanized Steel: ASTM A525, G90 finish, 24-ga core steel
C. Stainless Steel: ASTM A167, Type 304, soft temper; 24-ga thick; smooth finish.
D. Provide dovetail; saw tooth, or other design to develop all direction bonding.
E. Lap Sealant: Butyl type as specified in Section 07 92 00

2.6 ACCESSORIES

A. Preformed Control Joints: Neoprene material, provide with corner and tee accessories, cement fused joints.
B. Joint Filler: Closed cell polyvinyl chloride; oversized 50% to joint width and self-expanding.
C. Cavity Wall Drainage System: High-density polyethylene to support mortar droppings and debris within the cavity.
D. Building Paper: No. 30 asphalt saturated felt.
E. Nailing Strips: Softwood, preservative treatment for moisture resistance, dovetail-shape, sized to masonry joints.
F. Weep: Preformed plastic tubes, hollow
G. Cavity Vents: Molded polyvinyl chloride grilles insect resistant.
H. Cleaning Solutions: Non-acidic, not harmful to masonry work or adjacent materials

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.
B. Provide temporary bracing during installation of masonry work.

1. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension, with vertical and horizontal joints of uniform thickness.
C. Concrete Masonry Units:
   1. Coursing: One unit and one mortar joint to equal 8"
   2. Mortar Joints: Concave
D. Brick Units:
   1. Coursing: Three units and three mortar joints to equal 8"
   2. Mortar Joints: Concave

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
D. Remove excess mortar as work progresses.
E. Interlock intersections and external corners.
F. Do not shift or tap masonry units after mortar has achieved initial set.
   1. Where adjustments are made, remove mortar, and replace.
G. Perform job site cutting of masonry units with proper tools to provide straight, clean, un-chipped edges.
   1. Prevent broken masonry unit corners or edges.
H. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen damp proofing is applied.
I. Isolate masonry partitions from vertical structural framing members with a control joint.
J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 WEEPS

A. Install weeps in veneer at intervals recommended by the Brick Institute of America.

3.6 REINFORCEMENT AND ANCHORAGES

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings and extend minimum 16" each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 8".
E. Reinforce stack-bonded unit, joint corners, and intersections with strap anchors 16" o.c.
F. All masonry below grade is to be grouted solid.
   1. Provide footing/wall dowels.
G. Measure the splice length from the finish floor.

3.7 REINFORCEMENT AND ANCHORAGES - VENEER MASONRY

A. Install horizontal joint reinforcement 16" o.c.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings and extend minimum 16 each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6".
E. Embed wall ties in masonry back-up for bonding veneer at maximum 16" o.c. vertically and 36" o.c. horizontally.
    1. Place at maximum 3" o.c. each way around perimeter of openings, within 12" of openings.
F. Secure wall ties, rods, strap, anchors to back-up and embed into masonry veneer at maximum 16" o.c. vertically and 36" o.c. horizontally.
    1. Place at maximum 3" o.c. each way around perimeter of openings, within 12" of openings.
    2. Provide length to extend a minimum of 1½" into the exterior wythe.
G. Reinforce stack bonded unit joint corners and intersections with strap anchors 16" o.c.

3.8 MASONRY FLASHINGS

A. Provide thru-wall flashing under parapet copings, for counter-flashing in masonry walls, where roofs abut, at lintels of exterior wall openings, ledge or shelf angles, under windowsills and band courses, at spandrel beams, foundation walls and where shown on drawings.
B. Turn flashing up minimum 8" and bed into mortar joint of masonry, seal to concrete, and seal to sheathing over framed back up.
C. Lap end joints minimum 6" and seal watertight.
D. Turn flashing, fold, and seal at corners, bends, and interruptions to form dams.

3.9 SILLS

A. See specification Section 08 51 13 – 3.1 B Sill & Bucks for windowsill requirements.

3.10 LINTELS

A. Install pre-cast concrete lintels over openings.
B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
C. Openings Up to 42" wide: Place two, No. 4 reinforcing bars 1" from bottom
D. Openings From 42" Up to 78" wide: Place two, No. 5 reinforcing bars 1" from bottom.
E. Opening Over 78": Reinforce openings as detailed.
F. Do not splice reinforcing bars.
G. Support and secure reinforcing bars from displacement.
    1. Maintain position within ½" of dimensioned position.
H. Place and consolidate grout fill without displacing reinforcing.
I. Allow masonry lintels to attain specified strength before removing temporary supports.
J. Maintain bearing on each side of opening.
    1. Minimum bearing of 8" on masonry.

3.11 ENGINEERED MASONRY

A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.

B. Place mortar in masonry unit bed joints back ¼" from edge of unit grout spaces, bevel back and upward.
   1. Permit mortar to cure seven days before placing grout.
C. Reinforce masonry unit cores and cavities with reinforcement bars and grout.
D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters.
   1. Splice reinforcement in accordance with Section 03 20 00.
E. Wet masonry unit surfaces in contact with grout just prior to grout placement.
F. Grout spaces less than 2" in width with fine grout using low lift grouting techniques.
G. Grout spaces 2" or greater in width, use a course grout.
H. When grouting is suspended for more than one hour, terminate grout 1½" below top of upper masonry unit to form a positive key for subsequent grout placement.
I. Low Lift Grouting:
   1. Place first lift of grout to a height of 16" and rod for grout consolidation.
   2. Place subsequent lifts in 8" increments and rod for grout consolidation.
J. High Lift Grouting:
   1. Provide cleanout opening no less than 4" high at the bottom of each grouted cell by cutting one face shell of masonry unit.
   2. In double wythe walls, omit every second masonry unit in one of the wythes for clean out and cell inspection purposes.
   3. In double wythe walls, construct vertical grout barriers or dams between the masonry wythes, with masonry units every 30' maximum.
   4. Clean out masonry cells and cavities with high-pressure water spray. Permit complete water drainage.
   5. Contractor shall request inspection of the cells and cavities.
      a. Allow three days advance notice of inspection.
   6. After cleaning and cell inspection, seal openings with masonry units.
   7. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
   8. Limit grout lift to 60" and rod for grout consolidation.
      a. Wait 30 to 60 minutes before placing next lift.

3.12 CONTROL AND EXPANSION JOINTS

A. Provide expansion joints and control joints to prevent uncontrolled stress cracks in the structure and according to the engineering's plans and standards.
B. Do not continue horizontal joint reinforcement through control and expansion joints.
C. Install preformed control joint device in continuous lengths.
   1. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Size control joint in accordance with Section 07 92 00 for sealant performance.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
B. Install built-in items plumb and level.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints.
   1. Fill frame voids solid with grout.
   2. Fill adjacent masonry cores with grout minimum 12" from framed openings.

D. Do not build in organic materials subject to deterioration.

3.14 TOLERANCES

A. Maximum Variation From Alignment of Columns and Pilasters: ¼"
B. Maximum Variation From Unit to Adjacent Unit: $^{1}/_{32}$"
C. Maximum Variation From Plane of Wall: ¼" in 10' and ½" in 20' or more
D. Maximum Variation From Plumb: ¼" per story non-cumulative, ½" in two stories or more
E. Maximum Variation From Level Coursing: ⅛" in 3' and ¼" in 10', ½" in 30'
F. Maximum Variation of Joint Thickness: ⅛" in 3'
G. Maximum Variation from Cross-Section Thickness of Walls: ¼"

3.15 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds.
   1. 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.

3.16 PARGING

A. Dampen masonry walls prior to parging.
B. Scarify each parging coat to ensure full bond to subsequent coat.
C. Parge masonry walls in two uniform coats of mortar to a total thickness of ¾" minimum.
D. Steel trowel surface smooth and flat with a maximum surface variation of ⅛" per foot.
E. Strike top edge of parging at 45°

3.17 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 Inspection Services.

3.18 CLEANING

A. Clean work under provisions of 01 77 00 and conform to ASTM, BIA, and ACI 530.
B. Remove excess mortar and mortar smears as work progresses.
   1. Replace material when mortar streaks and/or stains are not removable by light cleaning.
   2. Do not use Abrasives for rubbing or scraping off mortar stains
C. Replace defective mortar and match adjacent work.
D. Clean soiled surfaces with cleaning solution.
   1. Use only cleaning products approved by the Architect and applied in direct conformance with the manufacturer's instructions.
   2. DO NOT USE Muriatic acid to clean masonry.
E. Use non-metallic tools in cleaning operations.

3.19 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 50 00.
B. Without damaging completed work, provide protective boards at exposed external corners that may be damaged by construction activities.

END OF SECTION

DIVISION 5 METALS

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Structural steel framing members, connections, support members, sag-rods, and struts
B. Base & cap plates, shear stud connectors, and expansion joint plates
C. Grouting under base plates

1.3 REFERENCES

A. AISC - Code of Standard Practice for Steel Buildings and Bridges
B. AISC - LRFD Manual of Steel Construction
C. AISC - ASD/LRFD Steel Construction Manual
D. AISC - Specifications for Structural Steel Buildings
E. AISC - Load and Resistance Factor Design Specification for Single-Angle Members
F. AISC - Specification for Allowable Stress Design of Single-Angle Members
G. AISC - Specification for the Design of Steel Hollow Structural Systems
H. ASCE 7 - American Society of Civil Engineers – Wind Loads
I. ASTM A36/A36M, Standard Specification for Carbon Structural Steel
J. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
K. ASTM A108 - Standard Specification for Steel Bars, Carbon, and Alloy, Cold-Finished
L. ASTM A123/A123M - Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
M. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
N. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel.
O. ASTM A307 - Standard Specification for Carbon Steel and Studs, 60 000 PSI Tensile Strength
P. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
Q. ASTM A449 - Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
R. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
S. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
T. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
U. ASTM A514/A514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

V. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
W. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts
X. ASTM A568/A568M - Standard Specification for Steel, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet, General Requirements for
Y. ASTM A992/A992M - Standard Specification for Structural Steel Building
Z. ANSI/AWS A2.4 - Symbols for Welding, Brazing and Nondestructive Examination
AA. AWS D1.1/D1.1M - Structural Welding Code
BB. FM - Roof Assembly Classifications
CC. SSPC (Steel Structures Painting Council) - Paint Manual
DD. UL - Fire Resistance Directory
EE. FBC - Florida Building Code
FF. SSPC: The Society for Protective Coatings:
    1. SSPC-Steel Structures Painting Manual.
    2. SSPC Paint 15-Steel Joist Shop Paint.
    3. SSPC Paint 20-Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
    4. SSPC SP 3-Power Tool Cleaning.
    5. SSPC SP 6-Commercial Blast Cleaning.
    6. SSPC SP 10-Near-White Blast Cleaning

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Shop Drawings:
    1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
    2. Connections
    3. Cambers and loads
    4. Indicate welded connections with AWS A2.4 welding symbols, along with net weld lengths.
    5. Indicate grade of steel.
C. Product Data: Provide data on standard framing members; describe materials and furnish, product criteria and limitations. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
    1. Recycled Content:
        a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
        b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
        c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
        d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
    2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
        a. Sourcing Location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
        b. Manufacturing Location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 - Submittals Procedures
B. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.
C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
D. Welders' Certificates: Certify welders employed on the Work, verifying AWS qualifications within the previous 12-months.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.
B. Maintain one copy of each document on site.
C. Fabricator: Company specializing in performing the work of this section with minimum five years documented experience with current AISC certification for standard Steel Building Structures (STD) and conventional Steel Building Structures (SBD).
D. Erector: Company specializing in performing the work of this section with minimum 5-years documented experience with certified steel erector (CSE) certification.
E. Shop Painter: Company specializing in performing work of this section with minimum 5 years documented experience.
F. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months.
G. State of Florida Professional Structural Engineer experienced in design of connection details shall design all connections not detailed on the plans from the Architect/Engineer of record.

1.7 REGULATORY REQUIREMENTS

A. Structural steel design and construction shall comply with FBC, ASCE 7 – Wind loads, and American Institute of Steel Construction, AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, 9th Edition."
B. Conform to UL, FM, and Warnock Hersey Assembly.

1.8 DELIVERY, STORAGE AND PROTECTION

A. Section 01 60 00 – Product Requirements: Transport, handle, store and protect product.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural WF Steel Members: A992/A992M, Grade 50
B. Structural Tubing: ASTM A500, Grade B. ASTM A501
C. Pipe: ASTM A53, Type E or S, Grade B
D. Shear Stud Connectors: ASTM A108, Grade 1015, headed, uncoated
E. Structural Plates and Angles: ASTM A36/A36M

F. Bolts, Nuts, and Washers: ASTM A307, A325 and A490 galvanized to ASTM A153/A153M for galvanized members
G. Anchor Bolts: ASTM A307 and A36
H. Welding Materials: AWS D1.1; type required for materials being welded
I. Sliding Bearing Plates: Teflon coated
J. Anchor Rods: ASTM F1554; Grade 55, weldable or ASTM A307; Grade A, as indicated on Drawings.
   1. Shape: Hooked or Straight as indicated on Drawings.
   2. Plate Washers: ASTM A36/A36M.
K. Threaded Rods: ASTM A36/A36M, ASTM A307; Grade A, ASTM A572/572M; Grade 50, or ASTM A588/A588M; Grade B, as designated on Drawings.
   1. Finish: Unfinished, or Hot dipped galvanized as noted.
L. Forged Structural Steel Hardware:
   1. Clevises and Turnbuckles: ASTM A108; Grade 1085.
   2. Eye Nuts and Eye Bolts: ASTM A108; Grade 1030.
   3. Sleeve Nuts: ASTM A108; Grade 1018.
M. Rod Ends, Yoke Ends and Pins, Cotter Pins, and Coupling Nuts: Carbon steel.
N. Grout: Use non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing, and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.
O. Shop and Touch-Up Primer: SSPC Paint 15, Type 1 red oxide, provide a uniform dry film thickness of 1.5 mils
P. Recycled Steel Content: Minimum total recycled content equal to 25 percent with 23 percent post-consumer recycled content, or minimum 7 percent pre-consumer recycled content at contractor's option.
Q. Touch-up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic

2.2 FABRICATION

A. Continuously seal joined members by intermittent welds and plastic filler.
   1. Grind exposed welds smooth.
B. Fabricate connections for bolt, nut, and washer connectors.
C. Develop required camber of members.

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-2.
B. Shop prime structural steel members
   1. Do not prime surfaces receiving fireproofing or field welds.
   2. Do not prime surfaces in contact with concrete.
   3. Do not prime surface of high strength bolts.
C. Galvanize structural steel members to ASTM A123/A123M; provide minimum 1.25 oz/sq ft galvanized coating.
D. All structural or miscellaneous steel exposed to earth or weather shall be hot dipped galvanized (G90).

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Provide shop testing and analysis of structural steel sections.
B. Shop test bolted and welded connections as specified for field quality control tests.
C. All shop full moment welded splices shall be tested.

D. All field full moment welded splices shall be tested.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions prior to beginning work.

3.2 ERECTION

A. Allow for erection loads, and sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
B. Field-weld components and shear studs indicated on shop drawings.
C. Field-connect members with threaded fasteners; torque to required resistance.
D. Do not field cut or alter structural members without approval of A/E.
E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
F. Grout under base plates. Trowel grouted surface smooth, splay neatly to 45°.
G. Provide nuts and lock washers for the connection of the kitchen hood hangers.
H. Do not hang ceilings, pipes, etc. from metal deck.
    1. Attach anchors to the top chord of steel truss/joist.
    2. Loads approved by structural engineer of record as shown on the structural drawings may be attached to the bottom cord of the truss or joist.
I. Provide protection of structural steel from corrosion – base plates, anchor angles embedded in concrete or soil.
J. Attach structural steel trusses to supports with either welds or bolts.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼" per story, non-cumulative.
B. Maximum Offset from True Alignment: ¼"

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: The District may require field inspection, testing of bolt torque, welds and torque of fasteners.
B. Bolted Connections: Inspect in accordance with AISC specifications.
    1. Visually inspect all bolted connections.
C. Welding:
    1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
    2. Visually inspect all welds.
    3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.
    4. Magnetic Particle Examination: ASTM E709
    5. Liquid Penetrant Examination: ASTM E165

3.5 WASTE MANAGEMENT

A. Waste Management: Collect offcuts and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 05 31 00
STEEL DECK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Steel roof deck and accessories
   2. Formed steel deck end forms to contain wet concrete
   3. Framed floor and roof openings greater than 12"
   4. Bearing plates and angles
   5. Shear stud connectors

1.3 REFERENCES

A. AISI - Specification for Steel the Design of Cold-Formed Steel Structural Members
B. ASCE 7 - American Society of Civil Engineers – Wind Loads
C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
D. ASTM A108 - Standard Specification for Steel Bars, Carbon, and Alloy, Cold-Finished
E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
F. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
H. ANSI/AWS A2.4 - Symbols for Welding, Brazing and Nondestructive Examination
I. AWS D1.3- Structural Welding Code – Sheet Steel
J. FM - Roof Assembly Classifications
K. SSPC (Steel Structures Painting Council) - Paint Manual
L. SDI - Steel Deck Institute - -Design Manual for Composite Decks, Form Decks, and Roof Decks
M. UL - Fire Resistance Directory
N. FBC - Florida Building Code

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Shop Drawings:
   1. Indicate decking plan, support locations, projections, openings and reinforcement, cellular raceways and outlet box locations, pertinent details, cant strips, special joining, anchor details, and accessories.

2. Provide manufacturer's specifications and installation instructions for each type of decking and accessories.
3. Florida PE specializing in steel joist and girders shall prepare, sign, and seal the erection plans and joists fabrication plans.

C. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.
D. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
E. Welders' Certificates: Certify welders employed on the Work, verifying AWS qualifications within the previous 12 months.
F. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
   1. Recycled Content:
      a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 QUALITY ASSURANCE

A. Fabricator: Company specializing in performing the work of this section with minimum 5-years documented experience.
B. Installer: Company specializing in performing the work of this section with minimum 5-years documented experience.
C. State of Florida Professional Structural Engineer experienced in design of connection details shall design all connections not detailed on the plans from the Architect/Engineer of record.

1.6 REGULATORY REQUIREMENTS

A. Structural steel design and construction shall comply with FBC, ASCE 7 – Wind loads, and AISI Specification for Steel the Design of Cold-Formed Steel Structural Members.
B. Properly certified Welders shall perform all work in accordance with AWS standards.
C. Conform to UL, FM, and Warnock Hersey Assembly.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Section 01 60 00 - Product Requirements: Transport, handle, store and protect product.
B. Follow the requirements and recommendations of AISI and Manufacturer for delivery, storage, and protection of materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A446, Grade E and A Structural Quality; with G90 galvanized coating conforming to ASTM A525
B. Plates, Angles, Miscellaneous Steel Shapes: ASTM A36/A36M steel, G90 galvanizing coating
C. Shear Connectors: Headed stud type, ASTM A108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.
D. Shear Connectors: Strap type, ASTM A1011/A1011M, Grade D, hot-rolled carbon steel.
E. Sheet Metal Accessories: ASTM A653/A653M, commercial quality, galvanized.
F. Galvanizing: ASTM A653/A653M, G90
G. Galvanizing Repair: Damaged galvanized surfaces, prepare surfaces and repair per ASTM A780.
H. Flexible Closure Strips: Use Manufacturer's standard vulcanized, closed cell, synthetic rubber.
I. Acoustic Sound Barrier Closures: Use Manufacturer's standard mineral fiber closures
J. Paint: Use Manufacturer's baked on, rust-inhibitive paint, for application to metal surfaces, chemically cleaned, and treated with a phosphate chemical.
K. Provide vented deck system for lightweight concrete installations.
L. Recycled Steel Content: Minimum total recycled content equal to 25 percent with 23 percent post-consumer recycled content, or minimum 7 percent pre-consumer recycled content at contractor's option.

2.2 FABRICATION

A. Minimum roof deck material shall be 22-gage galvanized painted wide rib steel sheets as per plan.
B. Form deck units in lengths to span at least three or more supports, with flush, telescoped, or nested 2" laps at ends and interlocking or nested side laps, of metal thickness, depth, and width indicated.
C. Roof Deck Units: Provide deck configurations complying with SDI Specifications and Commentary for Steel Roof Deck.
D. Metal Cover Plates:
    1. Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking.
    2. Form to match contour of deck units and approximately 6" wide.
E. Metal Closure Strips:
    1. Fabricate metal closure strips, for sell raceways and openings between decking and other construction, of not less than 0.045", minimum 18-gage sheet steel.
    2. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.
F. Roof Sump Pans:
    1. Fabricate from single piece of 0.071", minimum 14-gage galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain.

2. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide.
3. Recess pans at least 1½" below roof deck surface unless otherwise shown or required by deck configuration.
4. Cut holes for drains in the field by others.

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-2.
B. Shop prime structural steel members
   1. Do not prime surfaces scheduled for fireproofing or field welding.
   2. Do not prime surfaces in contact with concrete.
   3. Do not prime surface of high strength bolts.
C. Galvanize steel ledger angle and plate members to ASTM A123/A123M; provide minimum 1.25 oz/sq ft galvanized coating for pre-engineered galvanized metal stud roof trusses.
D. Shop Painting
   1. Remove all loose scale, rust, and other foreign materials from fabricated joist, girder, and accessories before applying paint.
   2. Spray, dip, or other approved method apply one shop coat of steel primer to steel joist, girder, and accessories, that applies a continuous paint film of at least 1.0 mil.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions prior to beginning work.

3.2 INSTALLATION

A. Install deck units and accessories in accordance with manufacturer's requirements, shop drawings, and as specified in this section.
B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting metal members before being permanently fastening.
   1. Do not stretch or contract side lap interlocks.
C. Align deck units for entire length of run of cells and with closure alignment between cells at ends of abutting units.
D. Place deck units flat and square, secure to adjacent framing without warp or deflection.
E. Do not place deck units on concrete supporting structure until concrete is cure and dry.
F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
G. Do not use floor deck units for storage or working platforms until permanently secured.
H. Fastening Deck units:
   1. Fasten deck units to supporting steel joist members by nominal 5/8" puddle welds or elongated welds of equal strength, spaced not more than 12" o.c. with a minimum of five welds per unit at each support or as specified in drawings. Use welding washers for gages less than 22 gage.
      a. Also, secure deck to each supporting member in ribs where side laps occur.
   2. Weld or use self-tapping self drilling No. 10 hex head screws at all perimeters at 12” o.c max.

3. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
4. Mechanically fasten side laps of adjacent deck units between supports as per plan, using self-tapping self-drilling No. 10 hex head or larger screws.
5. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading, as indicated on plans.

I. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown on plans.

J. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work as shown.

K. Hanger Slots or Clips: Provide UL-approved punched hanger slots between cells or flutes of lower elements where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.
1. May use hanger clips designed to clip over male side lap joints of floor deck units instead of hanger slots.
2. Locate slots or clips not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless indicated otherwise.
3. Provide manufacturer's standard hanger attachment devices.

L. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except at taped joints.

M. Roof Sump Pans: Place them over openings in roof decking and weld to top decking surface, spacing the welds not more than 12" o.c. with at least one weld at each corner.

N. Shear Connectors:
1. Weld shear-connectors to supports through decking units in accordance with manufacturer's instructions.
2. Do not weld connectors through two layers (lapped ends) of decking.
3. Weld only on clean dry deck surfaces.

O. Closure Strips: Provide and weld metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction to provide complete decking installation.
1. Provide and install flexible closure strips instead of metal closures, at Contractor's option, wherever their use ensures complete closure, use adhesive per manufacturer's instructions.

P. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots and bottom surfaces of decking units and supporting steel members at all exposed areas with no ceilings.
1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
3. In areas of exposed shop painted surfaces, apply touch-up paint to blend into adjacent surfaces.

Q. Ridge and Valley Plates:
1. Weld ridge and valley plates to the top surface of the roof decking.
2. Lap end joints not less than 3", with laps made in the direction of water flow.

R. Repair and Valley Plates:
1. Holes up to ½" in diameter fill with urethane or silicone sealant and cover with duct tape.
2. Holes over ½" diameter require sheet metal plate patches fastened to deck.

3.3 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated area for recycling.

END OF SECTION

SECTION 05 40 00
COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Load bearing formed steel stud interior wall and other framing not for exterior walls or roof structures.
   2. Formed steel joist, purlins, slotted channel and miscellaneous framing and bridging.
   3. Pre-engineered cold formed metal roof trusses, bracing and accessories.

1.3 REFERENCES

A. AISI - American Iron and Steel Institute - Cold-Formed Steel Design Manual.
B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
C. ASTM A645/A645M - Standard Specification for Pressure Vessel Plates, Five Percent Nickel Alloy Steel, Specially Heat Treated.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
F. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases
G. AWS D1.1/D1.1M - Structural Welding Code
H. ANSI/AWS D1.3 - Light Steel Welding Code
I. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.
J. FBC - Florida Building Code
K. MFMA (Metal Framing Manufactures Association) - Guidelines for the Use of Metal Framing
L. ASCE 7 - Wind loads

1.4 SYSTEM DESCRIPTION

A. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
B. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Shop Drawings:
   1. Indicate component details, framed openings, bearing, anchorage, loading, welds, type, and location of fasteners, and accessories or items required of related work.
   2. The same specialty engineer shall certify the erection and fabrication plan.
C. Indicate stud, floor joist, ceiling joist, roof joist, roof rafter, roof truss, and layout.
D. Describe method for securing studs to tracks and for bolted or welded, screwed framing connections.
E. Provide shop drawings signed and sealed by Specialty Engineer who shall be a Professional Structural Engineer, licensed in Florida.
F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
G. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
   1. Recycled Content:
      a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.6 REGULATORY REQUIREMENTS

A. Design light gage metal framing in accordance with the FBC, and AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
B. Wind loads shall be in accordance with ASCE 7-10.
C. Design interior partitions for a minimum of 5 PSF with no stress increase.
D. FBC 2010 Building Code

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 5-years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum 3-years documented experience.
C. Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Florida.

1.8 MOCKUP

A. Provide mockup of exterior framed wall including insulation, sheathing, window frame, doorframe, and interior and exterior finish specified in other sections, under provisions of Section 01 40 00.
B. Mockup Size: 6' x 4' including corner condition.
C. Mockup may not remain as part of the Work.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate with the placement of components within the stud framing system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Light Gage Metal Framing:
   1. Clark Framing Systems, Inc.
   2. Dietrich Metal Framing.
   3. Marino\Ware Industries, Inc.
   4. Unimast Incorporated (USG).

2.2 MATERIALS

A. Steel Studs thickness and grade as required by Contract Drawings or Shop Drawings, but not less than the following:
   1. 4-inch, 20 gauge (minimum), galvanized.
   2. 6-inch, 20 gauge (minimum), galvanized.
   3. 8-inch, 18 gauge (minimum), galvanized.
B. Steel Runner Track thickness and grade as required by Contract Drawings or Shop Drawings, but not less than the following:
   1. 22 gauge for 3-5/8 inch studs.
   2. 20 gauge for 4 inch and 6 studs.
   3. 18 gauge for 8-inch studs.
C. Coating: Steel studs and runner track shall comply with ASTM 525 and have a G-60 galvanized coating.
D. Steel Studs, Runner Track, and Accessories:
   1. 12, 14, and 16 Gauge: Form of steel meeting the requirements of ASTM A653, Grade D, with a minimum yield of 50,000 psi.

2. 18, 20 and 22 Gauge: Form of steel meeting with the requirements of ASTM A653, Grade A, with a minimum yield of 33,000 psi.

E. Recycled Steel Content: Minimum total recycled content equal to 25 percent with 23 percent post-consumer recycled content, or minimum 7 percent pre-consumer recycled content at contractor's option.

2.3 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered.
B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered.
C. Shop and Touch-up Primer: SSPC - Paint 15, Type Type-1, red oxide.
D. Touch-Up Primer for Galvanized Surfaces: SSPC - Paint 20 Type-I Inorganic.

2.4 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers, use ASTM A123/A123M, hot dip galvanized to 1.25 oz/sq ft.
B. Anchorage Devices: Power-actuated, drilled expansion bolts and screws with sleeves.
C. Welding: In conformance with AWS D1.1/D1.1M and AWS D1.3

2.5 FABRICATION

A. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.
B. Fit and assemble in largest practical sections for delivery to site, ready for installation.

2.6 FINISHES

A. Studs: Galvanize to G60 coating class, prime paint.
B. Tracks and Headers: Galvanize to G60 coating class, prime paint.
C. Joists and Purlins: Galvanize to G60 coating class, prime paint.
D. Bracing, Furring, Bridging: Same finish as framing members, prime paint.
E. Plates, Gussets, Clips: Same finish as framing members, prime paint.
F. Plates, Gussets, Clips: Same finish as framing members, prime paint.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.
B. Verify that substrate surfaces and building framing components are ready to receive work.

3.2 ERECTION OF STUDDING

A. Install components in accordance with manufacturer's instructions.
B. Use of powder- actuated shots is prohibited, except in anchoring tracks to concrete or steel.
C. Stud Spacing: Maximum 16 inches on center, unless otherwise indicated on the drawings.
1. Frame corners with three studs.

2. Frame wall openings wider than stud spacing with double 20-gauge studs at each jamb. Connect studs with clips min 48-inch AF and one at head.

D. Align floor and ceiling tracks; locate to partition layout. Secure in place with fasteners.
   1. Coordinate installation of sealant with floor and ceiling tracks.
E. Place studs not more than 2" from abutting walls and at each side of openings.
   1. Connect studs to tracks using fasteners.
F. Construct corners using minimum three studs.
   1. Double stud wall openings; door and window jambs.
G. Erect load-bearing studs in one-piece full length do not splice the studs.
H. Erect load-bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.
I. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
J. Install intermediate studs above and below openings to align with wall stud spacing.
K. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
L. Attach cross studs and furring channels to studs for attachment of fixtures anchored to walls.
M. Install framing between studs for attachment of mechanical and electrical items, plus to prevent stud rotation.
N. Touch-up field welds and damaged galvanized and primed surfaces with primer.

3.3 ERECTION OF JOISTS PURLINS

A. Install framing components in accordance with manufacturer's instructions.
B. Make provisions for erection stresses.
   1. Provide temporary alignment and bracing.
C. Place joists and purlins not more than 2" from abutting walls.
   1. Connect joists to supports using fastener method.
D. Set floor and ceiling joists parallel and level with lateral bracing and bridging.
E. Locate joist end bearing directly over load bearing studs or provide load-distributing member to top of stud track.
F. Provide web stiffeners at reaction points.
G. Touch-up field welds and damaged galvanized and primed surfaces with primer.

3.4 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Shop fabricated ferrous metal items including but not limited to stairs, ladders, and roof opening frames.
   2. Shop fabricated aluminum items.

1.3 REFERENCES

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
B. AAMA 204 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
C. AAMA 606.1 - Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum
D. AAMA 607.1 - Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
E. AAMA 608.1 - Voluntary Guide Specifications and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum
F. ANSI A14.3 - American National Standard for Ladders - Fixed - Safety Requirements
G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel
H. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products
J. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
K. ASTM A283 - Carbon Steel Plates, Shapes, and Bars
L. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
M. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
N. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
O. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings
P. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings
Q. ASTM B177 - Standard Guide for Engineering Chromium Electroplating
R. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

S. ASTM B210 - Standard Specification for Aluminum-Alloy Drawn Seamless Tubes
T. ASTM B211 - Standard Specification for Aluminum-Alloy Bar, Rod and Wire
U. ASTM B221 - Standard Specification for Aluminum-and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
V. AWS A2.4 - Standard Symbols for Welding, Brazing, Nondestructive Examination
W. AWS D1.1/D1.1M - Structural Welding Code Bundled Set B
X. FBC - Florida Building Code
Y. SSPC - Steel Structure Painting Council - Steel Structures Painting Council

1.4 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size, and type of fasteners, and accessories.
    1. Include erection drawings, elevations, and details.
C. Indicate welded connections using standard AWS A2.0 welding symbols.
    1. Indicate net weld lengths.
D. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
    1. Recycled Content:
        a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
        b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
        c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
        d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
    2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
        a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
        b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
        c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
        d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
B. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12-months.
C. Finish joints in accordance with NOMMA Guideline 1.

PART 2 PRODUCTS

2.1 MATERIALS – STEEL

A. Steel Sections: [ASTM A36/A36M.] and/or [ASTM A572/A572M; Grade 50.]
B. Steel Plate: [ASTM A36/A36M.] and/or [ASTM A572/A572M; Grade 50.]
C. Hollow Structural Sections: [ASTM A500, Grade B.] and/or [ASTM A501.]
D. Steel Pipe: ASTM A53/A53M, Grade B Schedule 40.
E. Sheet Steel: ASTM A653/A653M, Grade 33 Structural Quality with galvanized coating.
F. Bolts: ASTM A307; Grade A or B and/or ASTM A325; Type 1.
   1. Finish: Unfinished or Hot dipped galvanized.
G. Nuts: ASTM A563 heavy hex type.
   1. Finish: Unfinished and/or Hot dipped galvanized as noted.
H. Washers: ASTM F436; Type 1.
   1. Finish: Unfinished, and/or Hot dipped galvanized as noted.
I. Welding Materials: AWS D1.1; type required for welded materials.
J. Ladders: ANSI A14.3.
K. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
L. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type I Inorganic zinc rich.
M. Recycled Steel Content: Minimum total recycled content equal to 25 percent with 23 percent post-consumer recycled content, or minimum 7 percent pre-consumer recycled content at contractor's option.

2.2 MATERIALS – STAINLESS STEEL

A. Bars and Shapes: ASTM A479/A479M, Type 304.
B. Tubing: ASTM A269 or ASTM A554; Type 304.
C. Pipe: ASTM A312/A312M, seamless, Type 304.
D. Plate, Sheet and Strip: ASTM A167; Type 304.
E. Bolts, Nuts, and Washers: ASTM A354.
F. Welding Materials: AWS D1.6; type required for materials being welded.

2.3 MATERIALS – ALUMINUM

A. Extruded Aluminum: ASTM B221/B221M, Alloy 6063], Temper T5 or T6.
B. Sheet Aluminum: ASTM B209/B209M, Alloy 5050-H-32, or temper best suited to application.
C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, Alloy 6063, Temper T6.
D. Aluminum-Alloy Bars: ASTM B211/B211M, Alloy 6063, Temper T6.
E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.
F. Aluminum-Alloy Die Castings: ASTM B85.
G. Bolts, Nuts, and Washers: Stainless steel.
H. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 LINTELS

A. Lintels: Steel sections, size and configuration as indicated on Drawings, length to allow 8 inches minimum bearing on both sides of opening.
   1. Exterior Locations: Galvanized.
   2. Interior Locations: Prime paint, one coat.

2.5 LEDGE AND SHELF ANGLES

A. Ledge and Shelf Angles, Not Attached to Structural Framing: For support of metal decking or joists; prime paint, one coat.

2.6 DOOR FRAMES

A. Door Frames: Steel Channel sections, size indicated on Drawings, with jamb anchors suitable for building into masonry or attachment to concrete or steel framing, minimum 4 anchors per jamb; prime paint, one coat.

2.7 BOLLARDS

A. Bollards: Steel pipe, concrete filled, crowned cap, 6 inches diameter, length as indicated on Drawings; prime paint, one coat.
B. Concrete Fill: 3,000 psi as specified in Section 03 30 00.
C. Anchors: Concealed type as indicated on Drawings.

2.8 LADDERS

A. Ladder: ANSI A14.3, Steel welded construction:
   1. Side Rails: $^{3}/_{8}$ x 2 inches, side rails spaced at 20 inches.
   2. Rungs: One-inch diameter solid rod spaced 12 inches on center.
   3. Mounting: Space rungs 7 inches from wall surface; with steel mounting brackets and attachments.
   4. Finish: Prime paint, one coat.
B. Ladder Safety Cage: Steel bar sections, minimum $^{1}/_{4}$ inches x 2 inches.
   1. Bottom hoop 18 inches radius maximum 74 inches above finished floor.
   2. Other hoops 14 inches radius spaced maximum 48 inches on center.
   3. Vertical bars spaced 10 inches on center.
   4. Finish: Match ladder finish.
C. Ladder Security Enclosure: Sheet steel minimum 16 gauge/0.058 inches thick, formed to enclose ladder side rails and rungs when closed and to swing free of ladder rungs and side rails with minimum 1-1/2 inches clear to side rails in open position.
   1. Provide continuous steel hinge full height of enclosure.
   2. Provide steel hasp for padlocking in closed and open position.
   3. Finish: Match ladder finish.

2.9 ANCHOR BOLTS

A. Anchor Rods: [ASTM F1554; Grade 55, weldable. or ASTM A307; Grade A.
   1. Shape: Hooked.
   2. Furnish with nut and washer; unfinished.
B. Drilled In Expansion Anchors.
   1. HILTI Corporation, Tulsa, OK
   2. Powers Fasteners, Brewster, NY
   3. ITW Redhead, Woodsdale, IL

2.10 FABRICATION

A. Fit and shop assemble in largest practical sections for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by continuous welds.
D. Grind exposed joints flush and smooth with adjacent finish surface.
   1. Make exposed joints butt tight, flush, and hairline.
   2. Ease exposed edges to small uniform radius.
E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish 2.
F. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts unobtrusively located consistent with design of component except as noted otherwise.
G. Supply components required for anchorage of fabrications.
   1. Fabricate anchors and related components of same material and finish as fabrication, except as noted otherwise.

2.11 FABRICATION TOLERANCES

A. Square: $^{1}/_{8}$" maximum difference in diagonal measurements.
B. Maximum Offset between Faces: $^{1}/_{16}$"
C. Maximum Misalignment of Adjacent Members: $^{1}/_{16}$"
D. Maximum Bow: $^{1}/_{8}$" in 48"
E. Maximum Deviation from Plane: $^{1}/_{16}$" in 48"

2.12 FINISHES - STEEL

A. Prepare surfaces to be primed in accordance with SSPC SP 2.
B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
C. Do not prime surfaces in where field welding is required.
D. Prime paint items with one coat.
E. Structural Steel Members:
   1. Galvanize after fabrication to ASTM A123/A123M. (Minimum 1.2 oz/sq. ft. coating thickness galvanize after fabrication.)
   2. Provide minimum 1.25 oz/sq ft galvanized coating.
F. Non-structural Items:
   1. Galvanize after fabrication to ASTM A123/A123M. (Minimum 1.2 oz/sq. ft. coating thickness galvanize after fabrication.)
   2. Provide minimum 1.25 oz/sq ft galvanized coating.
G. Chrome Plating: ASTM B177, weight, nickel-chromium alloy, satin finish.
H. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.13 FACTORY APPLIED FINISHES - STAINLESS STEEL

A. Satin Polished Finish: Number 4, satin directional polish parallel with long dimension of finished face.

2.14 FINISHES - ALUMINUM

A. Finish coatings to conform to AAMA 611. Comply with AA DAF-45.
B. Interior/Exterior Aluminum Surfaces: AAMA A41 anodized, Class I, clear color.
C. Interior/Exterior Aluminum Surfaces: AAMA A43 anodized, Class I, to selected color.
D. Hot Dip Galvanizing: Where specified or indicated, hot dip galvanized ferrous items according to ASTM A385 and ASTM A123, minimum 2.0 ounces per square foot.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
B. Supply required items for casting into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, stresses, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated on shop drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
G. Provide isolation coatings where dissimilar metals are in contact or where aluminum is in contact with concrete.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Plumb: ¼" per story, non-cumulative.
B. Maximum Offset from True Alignment: ¼"
C. Maximum Out-of-Position: ¼"

3.5 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 05 52 00
METAL RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Aluminum pipe handrails, balusters, and fittings.

1.3 REFERENCES

A. AA (Aluminum Association) - Designation System for Aluminum Finishes
B. ACSE 7 - Wind Loads
C. NAAMMM - Metal Finishes Manual for Architectural and Metal Products
D. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings
E. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings
F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
G. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
H. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bars, Rods, and Wire
I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
J. ASTM B241/A241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
K. ASTM B483 - Standard Specification for Aluminum and Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications
L. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
M. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings
N. AWS A2.4 - Standard Symbols for Welding, Brazing, Nondestructive Examination
O. AWS D1.1/D1.1M - Structural Welding Code Bundled Set B
P. AAMA 606.1 - Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum
Q. FBC - Florida Building Code

1.4 DESIGN REQUIREMENTS

A. Railing assembly, wall rails, and attachments shall conform to the FBC.
B. Design stairs and handrails to conform to ASCE 7.

1.5 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size, and type of fasteners, and accessories.
C. Samples: Submit 1' long samples of handrail. Submit samples of elbow, tee, wall bracket, escutcheon and end stop.
D. Certification: Submit written certification prepared, signed, and sealed by a Professional Engineer, registered to practice in the State of Florida verifying that the metal handrail system design meets indicated loading requirements and codes of authorities having jurisdiction.
E. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
    1. Recycled Content:
        a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
        b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
        c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
        d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
    2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
        a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
        b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
        c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
        d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

PART 2 PRODUCTS

2.1 ALUMINUM RAILING SYSTEM

A. Rails and Posts: 1½" outside diameter, excluding tubing conforming to ASTM B211.
B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast aluminum.
C. Mounting:
    1. Provide adjustable brackets and flanges, with aluminum inserts for casting in concrete with aluminum brackets for embedding in masonry.
    2. Prepare backing plate for mounting in wall.
D. Exposed Fasteners: Flush countersunk screws or bolts consistent with design of railing.
E. Splice Connectors: Concealed spigots; cast aluminum.
F. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.
G. Recycled Content: Provide post-consumer recycled and pre-consumer recycled content.

2.2 FABRICATION

A. Fit and shop assemble components as large as practical for delivery to site.
B. Fabricate components with joints tightly fitted and secured.
   1. Provide spigots and sleeves to accommodate site assembly and installation.
C. Provide anchors, plates, and angles required for connecting railings to structure.
D. Exposed Mechanical Fastenings, install flush-countersunk screws or bolts that are unobtrusively located and are consistent with the design of component.
E. Supply components required for anchorage of fabrications.
   1. Fabricate anchors and related components of same material and finish as fabrication, except as noted otherwise.
F. Exterior Components:
   1. Continuously seal joined pieces by continuous welds.
   2. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
G. Interior Components: Continuously seal joined pieces by continuous welds.
H. Grind exposed joints flush and smooth with adjacent finish surface.
   1. Make exposed joints butt tight, flush, and hairline.
   2. Ease exposed edges to small uniform radius.
I. Accurately form components to suit stairs and landings to each other and to building structure.
J. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

2.3 FINISHES

A. Exterior Aluminum Surfaces: Exterior anodized to clear color.
B. Interior Aluminum Surfaces: Interior anodized to clear color.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean and strip aluminum where site welding is required.
B. Supply items being cast into concrete, embedded in masonry, or placed in partitions with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install components plumb and level, accurately fitted, free from distortion or defects.
C. Anchor railings to structure with anchor plates and angles.
D. Field weld anchors as indicated on shop drawings grind welds smooth and touch-up with primer.
E. Conceal bolts and screws whenever possible, if cannot, use flush countersunk fastenings.
F. Assemble with spigots and sleeves to accommodate tight joints and secure installation.
G. Install floor mounted support post plumb and secure in the concrete within a core-drilled hole filled with epoxy grout.

H. All fasteners into concrete shall be stainless steel.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼" per story, non-cumulative.
B. Maximum Offset From True Alignment: ¼"
C. Maximum Out-of-Position: ¼"

3.5 WASTE MANAGEMENT

A. Waster Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

DIVISION 6

WOODS AND PLASTICS

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. The majority of the carpentry work is shown on the drawings and schedules but includes all rough carpentry such as miscellaneous rough carpentry, roof curbs, cants, blocking, nailers, grounds, concealed wood blocking, panel backboards, etc. whether shown, not shown, or required for proper installation of other work.

1.3 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20, except as otherwise indicated
B. Plywood Standard: Comply with PS 1, except as otherwise indicated
C. Factory-mark each piece of lumber and plywood with type, grade, mill, and grading agency, except omit marking from exposed surfaces with transparent finish or without finish.
D. AWPA (American Wood Preservers Association) Standards
E. Sustainably Harvested Wood: Certification Organizations shall be accredited by the Forest Stewardship Council, Sustainable Forestry Board or Canadian Standards Association.

1.4 SUBMITTALS

A. Wood Treatment Data: Submit two copies of chemical treatment manufacturer's instructions for proper use of each type of treated material.
   1. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
   2. Do not use treatments known or suspected to be a carcinogen.
B. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
   1. Recycled Content:
      a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

2. Local/Regional Materials: Provide materials extracted/harvested and manufactured within a 500-mile radius from the project site.
    a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
    b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
    c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
    d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
3. VOC Data:
    a. Adhesives:
        i) Submit manufacturer's product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
        ii) Submit Green Seal Certification to GS-36 and description of the basis of certification.
        iii) Submit manufacturer's certification that products comply with SCAQMD #1168.
4. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

C. Letter of Certification(s) for Sustainable Forestry:
1. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC “Principles for Natural Forest Management” and identify certifying organization.
    a. Submit FSC certification numbers; identify each certified product on a line-item basis.
    b. Submit copies of invoices bearing the FSC certification numbers.
2. Sustainable Forestry Board: Provide letter of certification signed by lumber supplier. Indicate compliance with the Sustainable Forestry Board’s “Sustainable Forestry Initiative” (SFI) and identify certifying organization.
    a. Submit SFI certification numbers identify each certified product on a line-item basis.
    b. Submit copies of invoices bearing SFI certification numbers.
3. Canadian Standards Association (CSA): Provide letter of certification signed by lumber supplier. Indicated compliance with the CSA and identify certifying organization.
    a. Submit CSA certification numbers; identify each certified product on a line-item basis.
    b. Submit copies of invoices bearing the CSA certification numbers.

1.5 PRODUCT HANDLING

A. Keep materials dry during delivery and storage.
B. Protect against exposure to weather and contact with damp or wet surfaces.
C. Stack lumber and plywood and provide air circulation within stacks.

1.6 REFERENCES

A. ALSC (American Lumber Standards Committee) – Softwood Lumber Standards
B. EWA (The Engineered Wood Association)
C. AWPA U1 – Use Category System- User Specification for Treated Wood
D. AWPA P5 – Standard for Waterborne Preservatives
E. AFPA (American Forest and Paper Association)

F. ANSI/APA (American National Standards Institute/American Plywood Association)
G. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
H. FBC – Florida Building Code

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber for blocking may be any grade and classified standard and better for western species or classified No. 2 for Southern Pine.
   1. All wood in contact with masonry or concrete shall be pressure treated.
   2. The manufacturer and applicator of pressure treatment shall mark all wood.
B. Do not install any wood material into any concealed spaces, except under the following conditions and meeting the requirements of FBC:
   1. The Architect or Engineers permitted set of plans show wood blocking.
   2. The wood blocking is a minimum nominal 2" x 4" and spans from metal stud to metal stud.
   3. Wood meets requirements of 2.1.A of this section.
C. DO NOT use Fire Retardant Treated Wood (FRTW) in educational facilities.
D. Lumber Grading Rules: National Forest Products Association
E. Plywood: APA Rated sheathing or exterior, Grade CDX; Exposure Durability 1; sanded
F. Building Paper: Asphalt saturated felt, non-perforated, ASTM D226, Type II.
G. Fasteners and Anchoring:
   1. Provide size and type as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.
   2. Provide hot-dipped galvanized anchors and hardware installed in contact with concrete, masonry, and roofing.
   3. Use treated wood products containing preservative using water as the preservative carrier.

2.2 WOOD TREATMENT

A. Treatment:
   1. Lumber or plywood indicated as "treated," or specified as treated, shall comply with the applicable requirement of the American Wood Preservers Association (AWPA).
   2. Mark each treated item to comply with the AWPA Quality Mark requirements for the specified requirements.
B. All wood used below grade and in contact with concrete or masonry shall be given pressure treatment with waterborne preservatives for decay and termite protection as follows:
   1. Pressure-treated lumber and plywood shall conform to AWPA U1 to AWPA P5 (waterborne) and bear a mark-certifying conformance.
   2. Retention requirements: Provide retention of 4.0 kg/m3 (0.25 pcf) and the notation that the material is intended for Above Ground Use and retention of 6.4 kg/m3 (0.40 pcf) with the notation that the material is intended for Fresh Water or Soil Contact Use.
   3. After treatment, kiln-dry to a maximum moisture content of 16%.
   4. Koppers "Wolmanized" brand shall be acceptable or approved equal.
   5. Wood treated with materials containing arsenic is not permitted.
C. Complete fabrication of treated items prior to treatment, wherever possible.
   1. If cut after treatment, coat cut surfaces with heavy brush coat of same preservative used for treatment.

2. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the substrates and supporting structure and the conditions before installing carpentry work.
B. Do not install on unsatisfactory conditions.

3.2 INSTALLATION

A. General:
   1. Discard units of material with defects that might impair the quality of the work, and units that are too small to fabricate the work with minimum joints or the optimum joint arrangement.
   2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
   3. Securely attach carpentry work to substrate by anchoring and fastening as required by recognized standards.
      a. Countersink nail heads on exposed carpentry work and fill holes.
      b. Use finishing nails for finish work.
      c. Select fasteners of size that will not penetrate members where opposite side will by exposed to view or will receive finish materials.
      d. Make tight connections between members.
      e. Install fasteners without splitting of wood; pre-drill as required.
B. Wood Grounds, Nailers, Blocking and Sleepers:
   1. Provide as shown and at all locations required for attachment of other work.
      a. Form shapes as shown or required. Coordinate location with other work involved.
   2. Stagger joints at least 6" for individual members in built-up installations.
   3. Attach to substrates as required to support applied loading.
      a. Countersink bolts and nuts flush with surfaces, unless otherwise shown.
      b. Build into masonry during installation of masonry work.
      c. Where possible, anchor to formwork before concrete placement.
C. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit.
   1. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow proper attachment of other work.
D. Do not expose wood products in attics, soffits, chases, or other spaces concealed within the building, clarify prior to installation.
E. Provide panel backboards 12" larger than the mounted equipment to the greatest extent practicable.
   1. Butt adjoining boards to form continuous backboard.
F. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Plastic laminate herein refers to millwork.
   2. Items installed by the Section, but provided by other Sections:
      a. Steel doors furnished in Specification Section – Metal Door and Frames.
      b. Wood doors furnished in Specification Section – Solid Core Wood Doors.
      c. Door hardware furnished in Specification Section – Door Hardware.
      d. Casework.

1.3 REFERENCES

A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
B. AWI – Quality Standards
C. BHMA A156.9 – Cabinet Hardware
D. FED MMM-A-130 – Adhesive, Contact
E. NEMA (National Electric Manufacturer's Association) LD3 – High Pressure Decorative Laminates.
F. PS 1 – Construction and Industrial Hardwood
G. PS 20 – American Softwood Lumber Standard

1.4 SUBMITTALS

A. Provide manufacturer's product data for purchased items installed in millwork prior to delivery and for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
B. Submit complete shop drawings by approved fabricator for proposed millwork items requiring shop fabrication processes.
C. Samples of:
   1. Proposed solid woods for transparent finish (three 3/4 inch by 3 inch by 8 inch pieces of each species and cut).
   2. Proposed veneered woods for transparent finish (three 3/4 inch by 8 inch by 8 inch pieces of each species and cut).
   3. Available color and pattern choices for plastic laminate surfacing (one complete chain).
D. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

1.5 QUALITY ASSURANCE

A. Quality Standards: Except as otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards."
B. Optimum Moisture Content: Kiln-dry woodwork to an average moisture content within the following ranges or as otherwise recommended by applicable Quality Standards for the regional climatic conditions involved.
   1. Exterior woodwork - 9 to 15 percent.
   2. Interior woodwork - 5 to 10 percent.
C. Sustainably Harvested Wood: Certification Organizations shall be accredited by the Forest Stewardship Council, Sustainable Forestry Board or Canadian Standards Association.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.
B. Do not deliver woodwork until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas which meet the requirements specified for installation areas.
C. Wood to be painted shall be sealed upon delivery to the site; refer to Sections 09 91 13 – Exterior Painting and 09 91 23 – Interior Painting.

1.7 PROJECT CONDITIONS

A. Examination of Substrate and Conditions: The Installer must examine the substrate and the conditions under which the Work under this Section is to be performed and notify the Contractor in writing of any unsatisfactory conditions. Do not proceed with Work under this Section until unsatisfactory conditions have been corrected.
B. Do not install woodwork until the required temperature and relative humidity have been stabilized in installation areas.
C. Maintain temperature and relative humidity as required for a tolerance of plus or minus one percent of the specified optimum moisture content until woodwork receives specified finishes. Maintain temperature and humidity conditions until acceptance of the Work by the Owner.
D. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.
E. Protect installed woodwork from damage by other trades until Owner's acceptance of the Work. Advise Contractor of required protection procedures.

PART 2 PRODUCTS

2.1 INTERIOR MATERIALS

A. General: Provide materials that comply with requirements of the AWI Woodworking Standard for each type of woodwork and quality grade indicated and, where the following products are

part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. High Pressure Laminate: NEMA LD3.
2. Softwood Plywood: PS 1.
3. Hardwood Plywood and Face Veneers: HPVA HP-1.
4. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
   a. Hardwood Plywood: HPMA FE

2.2 EXTERIOR MATERIALS

A. Materials, General
   1. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
   2. Plywood Standards: APA Rated, interior plywood to receive transparent finish shall be natural birch.
   3. Grade Stamps: Provide lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

2.3 MISCELLANEOUS LAMINATE CLAD ITEMS

A. Laminate clad casework shall comply with custom grade quality standards as set forth in AWI, Section 400, Division 400B, "Laminate clad cabinets".
B. High Pressure Plastic Laminate (for miscellaneous millwork items).
   1. Plastic laminate except backing or balancing sheets shall be high pressure laminate conforming to NEMA LD-1985. Color shall be selected by the Architect from the full line of standard colors.
   2. Exposed Horizontal Surfaces: Shall be nominal .050 inch thick minimum with textured finish and conforming to NEMA standards for GP50 horizontal grade.
   3. Exposed and Semi-Exposed, Interior and Exterior Vertical Surfaces: Shall be .028 inch thick minimum with low lustre textured finish and conforming to NEMA standards for GP28 vertical grade.
   4. Backing Sheet for Concealed Surfaces: Shall be .030 or .020 inches thick, conforming to NEMA standards for GP28 vertical grade or CL20 cabinet liner.
   5. Backing Sheet for Semi-Exposed Surfaces: Shall be .028 inches thick, conforming to NEMA standards for GP28 vertical grade. Use to balance face laminate.
C. Plastic laminate shall be “Design Group I” series as manufactured by Wilsonart, Temple, Texas; specified as type, function, color and quality of the products required.
D. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of type, color, and function as required:
   1. Formica Corporation, Cincinnati, Ohio
   2. Laminart, Elk Grove Village, Illinois
   3. Nevamar Corp., Odenton, Maryland
   4. Pioneer Plastics Corp., Auburn, Maine
   5. Arborite, Forbo, Quebec, Canada

2.4 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
   1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
B. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

PART 3 EXECUTION

3.1 PREPARATION

A. Condition finish carpentry to average prevailing humidity conditions in installation areas prior to installing.
B. Before installing finished carpentry, examine shop fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 FINISH CARPENTRY INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.
B. Install, plumb, level, true, and straight with no distortions. Shim as required using concealed shims.
C. Cut to fit unless specified to be shop fabricated or shop cut to exact size. Where woodwork abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners.
D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use screws or fine finishing nails for exposed fasteners, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
E. Distribute defects allowed in the quality grade specified to the best overall advantage when installing job assembled woodwork items.

3.3 STEEL DOOR INSTALLATION

A. Delivery, Storage, and Handling
   1. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
   2. Observe doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

3. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to promote air circulation.

B. Installation: Install standard steel doors, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.
   1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.
   2. Smoke Control Doors: Comply with NFPA 105.

3.4 WOOD DOOR INSTALLATION

A. Handling and Protection
   1. Upon delivery to jobsite, unload wood doors and place in safe, dry, and secure storage area.
   2. Protect wood doors from damage and improper storage and handling, both before and after finishing and installation.

B. Inspection
   1. Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors. Notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

C. Installation
   1. Prefit Doors: Fit to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.
      a. Install nonrated wood doors in accordance with manufacturer's instructions and as shown. AWI standards for custom grade, Section 1400 and 1700.
      b. Install fire rated doors in corresponding fire rated frames in accordance with requirements of NFPA No. 80.
   2. Clearance: For nonrated doors provide clearances of 1/8 inch at jambs and heads; 1/8 inch at meeting stiles for pairs of doors; and 1/2 inch from bottom of door to top of decorative floor finish or covering. Provide 1/8” back bevel at strike jamb face. Where threshold is shown or scheduled, provide 1/4 inch clearance from bottom of door to top of threshold.
      a. For fire rated doors provide clearances complying with NFPA 80.
      b. Smoke Control Doors: Comply with NFPA 105.

D. Field Quality Control
   1. Wood doors having any of the following defective conditions will be rejected:
      a. Not operating properly, such as swinging, sliding, latching, etc.
      b. Damaged face or edge.
      c. Unsealed edges, tops, and bottoms.
      d. Irregularities in surface finish, such as roughness, "skips," "runs," or other blemishes in color or gloss.
   2. If operation defects cannot be corrected by repairing or rehanging, replace door with new unit.
   3. Doors damaged prior to or during installation shall be replaced at no cost to the Owner.

3.5 DOOR HARDWARE INSTALLATION

A. Install each hardware item in compliance with the manufacturer's instructions and recommendations.
B. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Where closers are specified, they shall be the last hardware item to be installed. Closers shall be mounted to wood and steel doors with sex bolts and machine screws; furnished by Section 08 71 00 – Door Hardware.
C. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
D. Cut and fit threshold and floor covers to profile of door frames with mitered corners and hairline joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts, and similar items.
E. Anchor thresholds to substrate with stainless steel machine screws.
F. At exterior doors and elsewhere as indicated, set thresholds in a bed of either butyl rubber sealant or polyisobutylene mastic sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealants.
G. Coordinate installation of hardware for wood doors with Sections 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting
    1. Wherever field cutting and fitting of wood doors is required for hardware installation, remove hardware after final fitting, allow painter to seal and finish "raw" surfaces, then reinstall hardware.

3.6 ADJUSTMENT AND CLEANING OF DOOR HARDWARE

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
C. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.
D. Continued Maintenance Service: Approximately 6 months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and readjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials, or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.
E. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 06 41 00
CUSTOM CASEWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Millwork and custom casework including cabinetry, countertops, and shelving
   2. Millwork and casework hardware and accessories

1.3 REFERENCES

A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
B. AWI – Quality Standards
C. BHMA A156.9 – Cabinet Hardware
D. FED MMM-A-130 – Adhesive, Contact
E. NEMA (National Electric Manufacturer’s Association) LD3 – High Pressure Decorative Laminates
F. PS 1 – Construction and Industrial Hardwood
G. PS 20 – American Softwood Lumber Standard

1.4 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings in accordance with Section 01 33 00.
   1. Indicate quality grade, materials, species, construction, sizes, shapes, quantities, locations, and conditions of adjoining work.
   2. Indicate items in related or dimensional position with sections or details shown either full size or 3" = 1'-0" scale.
   3. Indicate required field measurements beyond control of mill.
   4. Indicate the allowable uniformly distributed loads for shelving.
B. Samples: Submit manufacturer's full range of sample colors, textures, and patterns of plastic laminate for Architect's selection.
C. Installation Instruction: Provide installation instructions and lists of replacement parts for all hardware and accessories.
D. Key Schedule:
   1. Provide lock and key schedule for lockable cabinets.
   2. Coordinate key schedule with Section 08 71 00 Door Hardware.
E. Certification: Submit certifications by treating plant that pressure treatment materials comply with governing ordinances.

1.5 DEFINITIONS

A. Exposed Portions of Casework: Include surfaces visible when doors and drawers are closed. Bottoms of casework more than two feet above floor and all tops shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.
B. Semi-Exposed Portions of Casework: Includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of casework 6 feet 6 inches or more above floor shall be considered semi-exposed.
C. Concealed Portions of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation

1.6 QUALITY ASSURANCE:

A. Millwork and casework fabricator: Minimum five-years previous experience of successfully completed comparable work.
B. Lumber Grading: Lumber Grading Rules and Wood Species in accordance with Voluntary Product Standards PS 20-70. Grading rules of Southern Pine Inspection Bureau (SPIB) apply to materials furnished.
C. Fire Hazard Classification: Comply with required NFPA, ANSI and UL surface burning characteristics for plastic laminates, lumber and plywood.
D. Perform work in compliance with AWI standards.

1.7 QUALITY ASSURANCE

A. Millwork and casework fabricator shall have a minimum 5-years previous experience of successfully completed comparable work.
B. Lumber Grading:
    1. Lumber Grading Rules and Wood Species in accordance with Voluntary Product Standards PS 20-70
    2. Grading rules of Southern Pine Inspection Bureau (SPIB) apply to materials furnished.
C. Fire Hazard Classification: Comply with required NFPA, ANSI, and UL surface burning characteristics for plastic laminates, lumber, and plywood.
D. Perform work in compliance with AWI standards.

1.8 MOCK-UP

A. Prepare mock-up under provisions of Section 01 40 00.
B. Provide full size base cabinet and upper cabinet of each type indicated, in specified finish with hardware installed.
C. Owner shall inspect units to ascertain quality and conformity to AWI Standards.
D. Units will establish a minimum standard of quality for this work.
E. Vendor may use undamaged approved units as part of the work.

1.9 FIELD MEASUREMENTS

A. Design and fabricate units based upon field conditions and measurements.
B. Verify field measurements are included in shop drawings.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference after site inspection and prior to commencement of work.
B. Discuss any items that may alter fabrications or intended installation and determine acceptable conclusions.

1.11 COORDINATION

A. Coordinate work with plumbing, mechanical, electrical, and other trades for rough-in work and installation of adjacent and associated components.

1.12 ENVIRONMENTAL REQUIREMENTS AND PROTECTION

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
B. Immediately prior to, during and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.
C. Protect work from damage until final acceptance.

1.13 GUARANTEE

A. The entire installation shall be guaranteed for a period of 3 years from the date of Substantial Completion against defects in material and workmanship in accordance with the terms of the Contract. The guarantee shall cover repair or replacement, without cost to the Owner, of items which become defective within the 3 year period. Damage to the equipment caused by improper operation or misuse is not covered by this guarantee.

PART 2 PRODUCTS

2.1 QUALITY GRADE

A. Materials and Fabrication: Provide premium grade construction and finishing in accordance with AWI "Quality Standards", conforming to Section 400B - Laminate Clad Cabinets.
B. Design Type: Reveal overlay design in accordance with AWI Architectural Casework - General Details, except as otherwise specified and detailed.

2.2 CABINET MATERIALS

A. Sub-base Material:
   1. Provide millwork or casework plywood cores of Hardwood Plywood "veneer core" with no-added-Urea Formaldehyde adhesives.
   2. Use ¾" thick, 7-ply closed-grain hardwood plywood typical unless noted otherwise.
   3. Use ¼" thick hardwood plywood at cabinet backs and drawer bottoms.
B. Adhesive: Provide type II, CS 35 or as recommended by plastic laminate manufacturer.
   1. Adhesives shall be low VOC meeting USGB LEED for Schools requirements for low VOC.
C. Plastic Laminate: High-pressure laminate, General Purpose Grade, NEMA LD3, GP-50 by Formica or Nevamar
   1. Exposed horizontal surfaces: Use 0.050" thick, matte finish.
   2. Exposed vertical surfaces: Use 0.030" thick, matte finish.
   3. Provide GP 42 for post forming: Use 0.042" thick, matte finish.

4. BK 20 for concealed backing: Use 0.020" thick, matte finish, vertical grade, white unless otherwise indicated.
5. Architect and the District's Design Coordinator shall select the Color and pattern, which may determine the laminate manufacturer.

D. Finish Hardware Items: Provide following items of finish hardware with millwork:
1. Drawer Glides: No. 8400 Extension Slides by Knape & Vogt Mfg. Co.
   a. Equal products to Knape & Vogt produced by Accuride and Blum are acceptable.
2. Shelf Standards and Supports (recessed in cabinets): No. 255 Standard and No. 256 Supports by Knape & Vogt Mfg. Co., Natural aluminum finish.
   a. Equal products to Knape & Vogt produced by Accuride and Blum are acceptable.
3. Doors: 1 pair heavy-duty institutional hinges, Stanley HT1592, US28.
   a. 1 catch, Stanley 41 Series.
   b. 1 pull, Stanley 4483, US28.
   c. Equal products to Stanley produced by Grant and Hettich America are acceptable.
4. Drawer Pulls: Stanley 4483, US28. Equal products to Stanley produced by Grant and Hettich America are acceptable.
5. Drawer Locks: Schlage CL 2000 or Olympus SC800 cabinet drawer lock, US26D, complete with strike plate.
   a. Provide locks with Interchangeable Core Schlage cylinders keyed to the existing Facility Master Key System as directed by Owner.
6. Door Locks: Schlage CL 1000 or Olympus SC700 cabinet door lock, US26D, complete with strike plate.
   a. Provide locks with Interchangeable Core Schlage cylinders keyed to the existing Facility Master Key System as directed by Owner.
   b. Provide one elbow catch per pair doors.
7. Cabinet locks keyed to the facility shall be coordinated with the Hardware Supplier of Section 08 71 00 who shall provide the locks.
8. Master key:
   a. Master key doors and drawers of cabinetry in each room with each other and the main entrance room door.
   b. Equal products to Schlage produced by Olympus are acceptable.
9. Silencers: Use neoprene type with self-adhesive at all cabinet doors.

E. Glazing: Provide clear, tempered glass for glazed doors and openings in cabinetwork, ¼" thick unless otherwise indicated, or approved.

F. Accessories: Provide adhesives, concealed fasteners, nuts, bolts, screws, pins, washers, and etc. of type and size to suit application and severity of use.
1. Provide finished grommets for holes and cut-outs

G. Miscellaneous: Provide shims, blocking, etc. as required for complete installation.

H. Leading Edges
1. Door and drawer fronts shall be edged with a nominal 3mm thick high impact PVC extrusion, with satin finish. Edges shall be machine applied with waterproof hot melt adhesive. Barbed T-edging will not be acceptable.
2. Horizontal and vertical front cabinet members shall be flat edged with a nominal 1mm thick high impact PVC extrusion, with a satin finish.
3. Colors of PVC leading edges:
   a. Open Units: Shall match exterior plastic laminate color.
   b. Horizontal and Vertical Front Cabinet Members: Shall match exposed plastic laminate color or as selected by Architect.
   c. Semi-Exposed Locations: Shall match interior plastic laminate color.

d. Drawer and Door Fronts: As selected from colors to match plastic laminate, or as selected by Architect

I. Plastic tote tray dividers shall be prefinished 1/4 inch thick tempered hardboard.
J. Tote Trays: Molded high impact plastic with card holder on front.

2.3 FABRICATION

A. General:
1. All exposed cabinet edges shall be beveled or rounded to prevent sharp edges or corners.
2. All counter tops exposed to room or student access have beveled or rounded edges, and exposed corners rounded with minimum ½" radius.

B. Fabrication Workmanship:
1. Construct millwork items in accordance with specified quality grade of reference standards, except as otherwise specified or detailed.
2. Construct millwork items using materials specified for plastic laminate finish.

C. Milling:
1. Fabricate and assemble work at mill as complete as practicable.
2. Deliver ready to assemble and set in place.
3. Machine sand all work at mill and deliver free of machine or tool marks or defects that will show through finish.

D. Plastic Laminate Tops, Panels, Cabinet Shelving, and All Exposed Surfaces:
1. Use plywood substrate as specified.
a. Particleboard, hardboard, and flake-board are not acceptable.
2. Glue tops and panels under pressure using Type II water- resistant adhesive.
a. Glue plastic, core, and backing sheet in one operation after applying edge bands.
3. 3/4 inch thick plywood with 1-1/2 inch built-up edge, and 1 inch radiused.
4. Laminate tops shall be continuous in practical lengths. When requiring splice joints, use a combination of splines or dowels for alignment and tite-joint fasteners as required to make a uniform and gapless joint.
a. Provide continuous top for counter type cabinets fixed in a line.
5. Provide 4 inch high scribable, square set, color matching, mechanically attached backsplash with endsplashes.
a. Backsplashes are required at locations where countertops abut walls where indicated.
b. Edges of back and endsplashes shall be of square edge configuration.
6. Sealants: Fully bed and seal splashes to tops and to other splashes with Dow Corning 786 Mildew Resistant Silicone Sealant, clear.

E. Fabricate finished tops and edges from one continuous sheet of plastic laminate.
1. Make corners and joints hairline.
2. Slightly bevel arises.

F. Fabricate finished tops and edges from one continuous sheet of plastic laminate. Make corners and joints hairline. Slightly bevel arises.

G. Ease the edges of millwork as required to eliminate sharp edges.

H. Backsplash and Aprons:
1. Square edge, direct bond cover, and full returns.
2. Make corners and joints hairline.

I. Cabinet Doors
1. Hinged Doors
a. 3/4 inch plywood.
b. 7/8 inch plywood on doors over 4 feet high.
c. 2 layers ¾ inch plywood on doors over 5 feet 6 inches high.

J. Provide plastic laminate finish on all exposed surfaces of doors, drawers, countertops, splashes, etc. of cabinets.
   1. Shelves shall be finished on all sides and edges.
K. Construction: Construct each unit or cabinet in one section where practical, or construct in largest practical sections to facilitate ease of handling and installation.
   1. Cabinet constructed in more than one section, ship trim and scribe strips loose at field joints.
   2. Locate counter butt joints minimum 2' from sink cutouts.
L. Finish Hardware: Fit drawer guides and cabinet-mounted shelf standards at mill.
   1. Ship other finish hardware items loose for installation at job site.
M. Glazing: Install glazing at mill to the greatest extent practical.
   1. Field glazing shall be with dry type glazing gaskets sized to eliminate gaps and prevent loose glazing installations.
N. Fixed and Adjustable Shelves
   1. 3/4 inch plywood shelves with high pressure laminate surfaces and edges.
   2. Number of adjustable shelves provided, unless indicated otherwise on the Drawings or on the Schedule
      a. Low and tall cabinets
         i) 1 up to 24 inches 4 up to 72 inches
         ii) 2 up to 36 inches 5 up to 84 inches
         iii) 3 up to 60 inches 6 up to 96 inches
      b. Wall hung cabinets
         i) 0 up to 24 inches 2 up to 36 inches
         ii) 1 up to 30 inches 3 up to 40 inches
O. Drawers
   1. 3/4 inch thick plywood drawer front
      a. High pressure plastic laminate both faces
      b. PVC leading edges
   2. 3/4 inch thick plywood drawer box
      a. Corner joints shall be interlocking glued and mechanically fastened or front and back tenoned into sides.
      b. Overlaid drawer fronts to be attached with screws from inside of drawer.
   3. Bottom
      a. 1/4 inch thick prefinished plywood.
      b. Dado into front, sides and back, glue and staple.
   4. Guides
      a. Roller guides as specified herein.
      b. Provide adjustable side mounted silencer stops.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces for conditions that would prevent quality installation of millwork.
B. Verify that grounds and blocking are in place to support millwork.
C. Do not install on defective conditions, doing so shall indicate acceptance of site conditions and require you to correct any defects.

3.2 INSTALLATION

A. General:
   1. Install all millwork items, plumb, level and true (within 1/16" in 10'), in accordance with drawing details and shop drawings.
   2. Do not install trim until backs and unexposed edges have been back primed.
   3. Provide cutting, fitting, fabricating, erecting, wedging, bracing, blocking, nailing, and securing of items of rough woodwork throughout, including miscellaneous furring, grounds, blocking, and nailers.
      a. Build-in items where indicated on Drawings or where required for attachment of finish and other work.
   4. Provide 4" high backsplash and end splashes at all locations where countertops abut walls.
   5. Fully bed backsplashes and end splashes to top and each other with Dow Corning #786 mildew resistant silicone sealant.
   6. Offsets: Offsets in plane on work surfaces and counters shall be negligible and no more than 1/32" at other abutting materials.

B. Cabinets:
   1. Install cabinets plumb with countertops level to within 1/16" in 10'.
   2. Level the base cabinets to within allowable tolerances.
   3. Accurately scribe and fit cabinet sides and tops, scribe strips, trim strips, and filler panels to irregularities of adjacent surfaces, maximum gap opening 0.025". Overlapping plastic laminate to fill gaps will not be permitted.
   4. Secure cabinets permanently to floor using anchors spaced at maximum of 30" o.c., minimum of two for each unit while maintaining ¾” clearance between the back of cabinet and the exterior wall.
   5. Bolt adjoining cases together, maximum width of joints 1/32".
   6. Fasten tops to bases with screws driven through base cabinet top frame into bottom of countertop.
   7. Scribe all backsplashes and aprons and caulk.
   8. Blocking, Bucks, and Nailers: Install plumb, level and true with joints flush, fastened securely in place.
   9. Furring and Stripping: Install plumb and level, shim to provide true finish surface.
   10. Install color-matched sealant at unfinished joints with other materials.
   11. Install wall-shelving standards on solid backing or with toggle bolts into steel studs or masonry or TEK screws into concrete.
      a. Do not install wall-shelving standards into gypsum wallboard only.
      b. Space standards as required to support indicated loading but not less than 5-plf based on shelf material provided.
   12. Do not install cabinetry or millwork closer than 24" to ceilings in fully sprinklered buildings or such that installation obstructs any fire sprinkler head.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly and correctly.
B. On completion of installation, touch up marred or abraded finished surfaces and wipe down surfaces to remove fingerprints and markings, and leave in clean condition.

3.4 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07 14 00
FLUID APPLIED WATERPROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Fluid applied rubberized asphalt membrane waterproofing
   2. Cant strips
   3. Protective covering

1.3 REFERENCES

A. ASTM C836 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
B. ASTM D412 – Standard Test Methods for Vulcanized rubber and Thermoplastic Elastomers - Tension
C. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer
D. ASTM D746 – Standard Test Method for Brittleness Temperature of Plastic and Elastomers by Impact
E. ASTM D822 – Standard Practice for Filtered Open-Flame Carbon Arc Exposures of Paint and Related Coatings
F. ASTM D1004 – Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting
G. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness
H. ASTM D3468 – Standard Specification for Liquid-Applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing
I. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials
J. NRCA (National Roofing Contractors Association) – Waterproofing Manual
K. FBC – Florida Building Code

1.4 PERFORMANCE REQUIREMENTS

A. Waterproofing System: A system capable of resisting water head pressure and from allowing moisture migration into interior of the building

1.5 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Product Data: Provide data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants with temperature range for application of waterproofing membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
D. Certificate: Certify that Products meet or exceed specified requirements.
E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 - Contract Closeout
B. Warranty: Submit completed manufacturer warranty forms in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual.
B. Waterproofing Manual Manufacturer: Company specializing in waterproofing membrane with minimum 5-years experience
C. Applicator: Company specializing in performing the work of this section with minimum 5-year documented experience and approved by manufacturer.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40° F for 24 hours before and during application and until liquid or mastic accessories have cured.
B. Groundwater:
   1. Where work of this Section will encounter groundwater, provide waterproofing manufacturer with sufficient groundwater samples taken from Project at logged locations for manufacturer’s laboratory analysis.
   2. Manufacturer shall provide written report confirming laboratory testing with regard to suitability of waterproofing system for installation in Project conditions.

1.9 WARRANTY

A. Section 01 77 00 - Contract Closeout
B. Correct defective Work within a five-year period after Date of Substantial Completion.
C. Provide 5-year manufacturer warranty for waterproofing failing to resist penetration of water.
D. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Elastomeric fluid applied membrane waterproofing shall be manufactured by the Toch-Carboline Company, St. Louis, Missouri; specified as the type, size, function, and quality of products required.
B. Protection board shall be manufactured by the Mead Paperboard Products, Dayton, Ohio; specified as the type, size, function, and quality of products required.
C. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and

arrangement required:

1. Elastomeric Membrane Waterproofing
   a. Sonneborn-Contech Inc., Minneapolis, Minnesota
   b. Mameco International, Cleveland, Ohio
   c. "CCW 525"; Carlisle Coatings and Waterproofing
2. Protection Board
   a. W.R. Meadows, Inc., Elgin, Illinois
   b. Carlisle Coatings and Waterproofing

2.2 MATERIALS

A. "Toch Primer CE" epoxy polyamide primer sealer.
B. "Toch Thio-Deck Membrane CF" coal tar free polyurethane fluid applied elastomeric membrane.
C. Closed cell butyl joint backer rod.
D. Thinners and retarders shall be as recommended by manufacturer.
A. Protection board shall be equal to "Membra-Mat" protection course consisting of a multi layer flexible board composed of pressure bonded cellulose fiber.

2.3 ACCESSORIES

A. Surface Conditioner: Compatible with membrane compound; as required by membrane manufacturer
B. Elastic Flashings: Neoprene as recommended by membrane manufacturer
C. Joint Cover Sheet: Elastic sheet material designed for and compatible with membrane
D. Cant Strips: Pre-molded composition material.
E. Joint and Crack Sealant: As required by membrane manufacturer.
F. Back-up Material: Butyl rod
G. Counter Flashings: Mil finish aluminum.

2.4 PROTECTIVE MATERIALS

A. Separation Sheet: Sheet polyethylene, minimum 6-mil thick

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Verify existing conditions before starting work
B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
D. Verify items, which penetrate surfaces receiving waterproofing, are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.
B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.
E. Fill construction and expansion joints with closed cell butyl rod within ½ inch of surface and prime coat at least 3 inches on each side of joint with Thio-Deck Membrane CF to 50 mil thickness.

3.3 APPLICATION

A. Apply to exterior side of CMU foundations below grade at all perimeter walls of building.
B. Apply waterproofing on outside face of foundation walls where elevation of interior floors is below the ground level and elsewhere as noted on Drawings. Extend waterproofing up from top of footings to top of foundation wall or from top of foundation wall at interior locations down to a point at least 12 inches below the lower floor grade.
C. Apply to interior walls of masonry or concrete that are arranged in such a way that the floor on one side of the wall is on fill or structurally supported and lies above the floor elevation on the opposite side of the wall.
D. Maintain ambient temperatures above 40° F for 24 hours before and during application and until liquid or mastic accessories have cured.
E. Apply surface conditioner at a rate recommended by manufacturer.
    1. Protect conditioner from rain or frost until dry.
F. Apply 12" wide strip of joint cover sheet over cracks, non-working joints, and expansion joints over 1/16" but not exceeding ½" in width.
G. At expansion joints from ½" to 1" in width, loop cover sheet down into joint between 1¼" and 1¾".
    1. Extend sheet 6" on either side of expansion joint.
H. Center cover sheet over crack or joints. Roll sheet material onto ⅛" coating of waterproofing material
    1. Apply second coat over sheet extending minimum of 6" beyond sheet edges.
    2. Apply this procedure to expansion joints between horizontal and vertical surfaces.
I. Apply waterproofing material in accordance with manufacturer's instructions.
J. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6" above horizontal surface for first ply and 6" at subsequent plies laid in shingle fashion.
K. Install cant strips at inside corners.
L. Apply extra thickness of waterproofing material at corners, intersections, angles and over joints.
M. Seal items protruding to or penetrating through membrane and install counter flashing membrane material.
N. Extend waterproofing material and flexible flashing into drain clamp flange.
    1. Apply adequate coating of liquid membrane to assure clamp ring seal.
    2. Coordinate with drain installation.
O. Install membrane flashings and seal into waterproofing material.
P. Conform to NRCA - Waterproofing Manual drawing details.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Control: Field inspection, testing, adjusting, and balancing.

B. On completion of membrane installation, dam installation area as directed by A/E in preparation for flood testing.
C. Flood to minimum depth of one-inch with clean water; after 48 hours, verify no leaks with A/E.
D. If leaking is found, remove water, patch leaking areas with new waterproofing materials as directed by A/E; repeat flood test.
    1. Repair all damage to building caused by the leak.
E. When area is proven watertight, drain water, and remove dam.

3.5 PROTECTION OF FINISHED WORK

A. Section 01 77 00 - Contract Closeout: Protecting installed work.
B. Do not permit traffic over unprotected or uncovered membrane.
C. After membrane has cooled, apply separation sheet, and lap joints to ensure complete coverage.

END OF SECTION

SECTION 07 21 13
RIGID POLYISOCYANORATE BOARD INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Rigid Polyisocyanorate Board Insulation

1.3 REFERENCES

A. ASHRAE Handbook 2001
B. ASTM C272 – Standard Test Methods for Water Absorption of Core Materials for Structural Sandwich Construction
C. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
D. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanorate Insulation Board
E. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics
F. ASTM E84 – Surface Burning Characteristics of Building Materials
G. ASTM E96 – Test Methods for Water Vapor Transmission Rate of Materials
H. FBC – Florida Building Code

1.4 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for insulation. Include data sustaining that material complies with specified requirements.
B. Product Data: Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
C. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
D. Operating and Maintenance Manuals Submittals
   1. Verify that plastic products to be incorporated into the Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual
      a. Type 1: Polyethylene Terephthalate (PET, PETE)
      b. Type 2: High Density Polyethylene (HDPE)
      c. Type 3: Vinyl Polyvinyl Chloride (PVC)
      d. Type 4: Low Density Polyethylene (LDPE)
      e. Type 5: Polypropylene (PP)
      f. Type 6: Polystyrene (PS)

g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

E. Documentation of manufacturer's take-back program for insulation materials. Coordinate with construction waster management. Include the following:
1. Appropriate contact information.
2. Overview of procedures.
3. Limitation and conditions, if any, applicable to the project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver to the job site in the original manufacturer's wrapping or individual sheets clearly marked to identify contents.
B. Protect all material from exposure to direct sunlight using an opaque, light-colored tarp, or the original manufacturer's packaging.
1. Protect any unwrapped material using an opaque, light-colored tarp or packaging.
2. Follow manufacturer's requirements.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Install only when surfaces are dry and inclement weather is not prevalent.

1.7 WARRANTY

A. Provide written warranty from the manufacturer that the actual thermal resistance of the extruded polystyrene insulation will not vary by more than 10% from its published thermal resistance.
B. Warranty period is 15-years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturer:
1. Dow Chemical Company, “Thermax Sheathing” or equal as approved by Architect.
B. Insulation: Provide rigid closed cell Polyisocyanorate insulation board with reflective faces on both sides conforming to the properties shown in the following table.

1. PROPERTY	TEST	@1" Thickness
a. Thickness: Refer to drawings and energy form.		
i) R-Value (F-ft-h/Btu) @ 75°F Mean Temperature	ASTM C518	6.5 (Min)
b. Compressive Strength	ASTM D1621	
i) Minimum		25 PSI (Min)
c. Water Absorption	ASTM C272	0.03% (Max)
d. Water Vapor Transmission Rate (perm)	ASTM E96	0.08-1.1 (Max)
e. Fire characteristics, maximum values		ASTM E84
i) Flame Spread		25 (Max)
ii) Smoke Developed		250 (Max)

C. Recycled Content:
   1. Recycled Content: Minimum 5 percent total recycled content.
   2. Basis of Design is Dow Thermax double-sided, metal-faced insulation.

2.2 ADHESIVE

A. Adhesive: Type recommended by insulation manufacturer.
   1. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials. GS-36 for Commercial Adhesive and as specified.

2.3 FASTENERS

A. Type as recommended by the insulation manufacturer.

2.4 SEAM TAPE

A. Type as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is flat, dry, and free of honeycombs, fins, or foreign material that will impede adhesive bond or damage the insulation board.
B. Beginning of installation means installer accepts the existing conditions.

3.2 INSTALLATION-GYPSUM UNDERLAYMENT SYSTEM

A. Install vertically with seams located on studs using fasteners.
B. Fasteners should be of sufficient length to penetrate the studs a minimum of ½".

3.3 INSTALLATION-MASONRY WALL

A. Attach to the masonry wall using a compatible adhesive, carefully following the manufacturer's installation instructions.
B. Tape all joints.

3.4 DRAFT STOPPING

A. Provide draft stopping in any concealed space of the extruded insulation at the ceiling line, or where gypsum board stops 6" above ceiling line at locations where interior wall(s) intersect or abut the exterior wall, at no more than 20' intervals in large rooms with walls over 20', and as required by FBC.
   1. Draft stopping shall be solid minimum 22-gauge metal strip.
   2. Anchor draft stopping independent of the extruded insulation.

3.5 SITE ENVIRONMENTAL PROCEDURES

A. Waste Management:
   1. Coordinate with manufacturer and local recycler for take-back program or recycling. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION

SECTION 07 21 16
BATT INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Batt insulation and vapor retarder in exterior wall and ceiling, roof construction.
   2. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
   3. Acoustical batt insulation for interior partitions.

1.3 REFERENCES

A. ASTM E96 – Test Method for Water Vapor Transmission of Materials
B. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
D. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C
E. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
F. ASTM C423 – Standard Test Method for Sound Absorption Coefficient by the Reverberation Room Method
G. NFPA 255 – Test of Surface Burning Characteristics of Building Materials
H. UL 723 – Test for Surface Burning Characteristics of Building Materials
I. Florida Building Code (FBC)

1.4 PERFORMANCE REQUIREMENTS

A. Materials of this Section: Provide continuity of thermal barrier at building enclosure elements.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
C. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
D. Operating and Maintenance Manuals Submittals:
   1. Verify that plastic products to be incorporated into the Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance manual.

a. Type 1: Polyethylene Terephthalate (PET, PETE).
b. Type 2: High Density Polyethylene (HDPE).
c. Type 3: Vinyl Polyvinyl Chloride (PVC).
d. Type 4: Low Density Polyethylene (LDPE).
e. Type 5: Polypropylene (PP).
f. Type 6: Polystyrene (PS).
g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

E. Documentation of manufacturer's take-back program for insulation materials. Coordinate with construction waste management. Include the following:
1. Appropriate contact information.
2. Overview of procedures.
3. Limitation and conditions, if any, applicable to the project.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate the work of Section 07 26 00 for installation of vapor retarder.

PART 2 PRODUCTS

2.1 MATERIALS

A. Thermal Batt Insulation: Provide and install ASTM C665; un-faced glass fiber thermal insulation, with thermal Resistant in accordance with ASTM C518, R-Value for insulation only as indicated on drawings.
1. FRK (foil), Type III, Class A, facing perm rate maximum 0.10.
2. PSK (white), Type II, Class A, facing perm rate maximum 0.10.
3. Surfacing Burning Characteristics for both FRK and PSK faced product:
4. Maximum Flame Spread: 25
5. Maximum Smoke Developed: 50
6. Combustion Characteristics: Non-combustible.
7. Dimensional Stability: Linear Shrinkage less than 0.1%
8. Provide batt insulation equal to or exceeding the R values for the following nominal thickness.
a. R=11 for 3-1/2"
b. R=19 for 6-1/4"
c. R=30 for 9-1/2"

B. Acoustical Batt Insulation: Provide and install ASTM C665 un-faced glass fiber acoustical insulation, install in areas as shown on the drawings.
1. Acoustical insulation blankets shall be semi rigid, spun, mineral fiber. Blankets shall be 2 inches thick minimum with 2.5 PCF density minimum. Width of blanket shall match spacing of studs and T-grids at ceilings, and length of blanket shall be 48 inches.
2. Sealant for perimeter of interior partitions having acoustical insulation shall be similar to USG acoustical sealant.
3. Type I.
4. Surfacing Burning Characteristics:
a. Maximum Flame Spread: 10
b. Maximum Smoke Developed: 10

5. Combustion Characteristics: Passes ASTM E136.
6. Fire Resistance Ratings: Passes ASTM E119 as part of a complete fire tested wall assembly.
7. Dimensional Stability: Linear Shrinkage less than 0.1%.

C. Recycled content: Minimum 25 percent total recycled content. Provide glass cullet recovered from municipal waste in accordance with ASTM D5359.

2.2 ACCESSORIES

A. Steel wire: electroplated; type and size to suit application.
B. Tape: Polyethylene self-adhering type, mesh reinforced.
C. Insulation Fasteners: Steel impale spindle and clip on flat metal base, self-adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.
D. Wire Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00
B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION

A. Install insulation in accordance with insulation manufacturer's instructions.
B. Install in exterior walls, roof, and ceiling spaces without gaps or voids do not compress insulation.
C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
E. Install with factory applied membrane facing exterior side of building spaces.
   1. Lap the ends and side flanges of membrane over framing members.
F. Retain in place with wire mesh secured to framing members.
G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
H. Metal Framing: If vapor barrier is used, place on exterior side of insulation; lap and seal sheet retarder joints over membrane face.
I. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
J. Acoustical sealant shall be used to seal the entire perimeter of partitions having acoustical insulation as indicated on the Drawings, to seal cutouts in these partitions, and to seal under control joints. Sealant shall be installed in strict accordance with the manufacturer’s written instructions.
K. Acoustical insulation shall be inserted between studs and extend the full height of the soundproof partition.

3.3 SITE ENVIRONMENTAL PROCEDURES

A. Waste Management: As specified and as follows:
   1. Coordinate with manufacturer or local recycler for take-back program or recycling. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION

SECTION 07 26 00
VAPOR RETARDERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Sheet and sealant materials for controlling vapor diffusion through on grade concrete slabs.

1.3 REFERENCES

A. 2001 ASHRAE Fundamentals Handbook: CHAPTER 25
B. ASTM C920 – Standard Specification for Elastomeric Joint Sealant
C. ASTM E96 – Test Methods for Water Vapor Transmission of Materials
D. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
E. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification
F. FBC - Florida Building Code
G. ACI 302.IR – Guide for Concrete Floor & Slab
H. ACI 302.2IR – Guide for Concrete Slabs that Receive Moisture Sensitive Flooring Materials (vapor barrier 0.01 perms, minimum 10-mils thick)

1.4 PERFORMANCE REQUIREMENTS

A. Water Vapor Transmission Rate: Maximum 1.1 grain/ft^2/24 hrs per ASTM E96
B. Minimum ASTM E1745 Class B rating for slabs on grade

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00
B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
C. Provide the manufacturer’s installation instructions indicating preparation and installation requirements techniques per ASTM E 1643.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.
B. Maintain one copy of each document on site.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene 1-week prior to commencing work of this section, under provisions of Section 01 31 00.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Above Grade Sheet Retarder: Polyethylene film, 6-mil thick, a perm rating of 1.1.
B. Below Grade Sheet Retarder (Slabs on grade) shall have the following properties
   1. Permeance Rating: Per ASTM E 96 or ASTM F 1249
      Shall meet permeance requirement for both new material and after ASTM E 1745 mandatory condition test (ASTM E 96 Sections 8, 11, 12, & 13)
      a. New material Less than 0.1 perms (gr/ft2/hr/in-HG)
      b. After conditioning: Less than 0.1 perms (gr/ft2/hr/in-HG)
   2. Water Vapor Retarder: ASTM E 1745 meeting or exceeding Class A
   3. Minimum thickness: 10-mils per ACI 302.2IR
   4. Polyethylene film reinforced with glass fiber square mesh, 15-mil thick, and perm rating of 0.5.

2.2 SEALANTS

A. Butyl Sealant: ASTM C920, butyl rubber base, single component, solvent release, non-skinning, black color
   1. Elongation Capability: 5%
   2. Service Temperature Range: - 40° to 180° F
   3. Shore A Hardness Range: 10 to 30
B. Polysulfide Sealant: ASTM C920, single component, chemical curing, capable of continuous water immersion, non-sagging type; black color.
   1. Elongation Capability: 25%
   2. Service Temperature Range: - 40° to 180° F
   3. Shore A Hardness Range: 20 to 35
C. Polyurethane Sealant: ASTM C920, single component, chemical curing, non-sagging, and black color
   1. Elongation Capability: 25%
   2. Service Temperature Range: - 40° to 180° F
   3. Shore A Hardness Range: 20 to 35
D. Primer: Recommended by sealant manufacturer to suit application.
E. Cleaner: Non-corrosive type; recommended by sealant manufacturer; compatible with adjacent materials.

2.3 ADHESIVES

A. Adhesive: Compatible with sheet barrier and substrate, permanently non-curing

2.4 ACCESSORIES

A. Thinner and Cleaner for Sheet: As recommended by sheet material manufacturer.
B. Tape shall be as required by the manufacturer of the vapor retarder with a maximum water vapor transmission rate of 0.3 perms (ASTM E 96).

C. Optional construction pipe booth from vapor barrier material applied per manufacturer's requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify condition of substrate and adjacent materials under provisions of Section 01 31 00.

3.2 PREPARATION

A. Remove loose or foreign matter that might impair adhesion.
B. Clean and prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.
B. Concrete slabs on grade shall have a vapor barrier located between the slab and the earth.
C. Lap all joints a minimum of 6" and tape joints.
D. Seal all penetrations (including pipes) per manufacturer's requirements.
E. Repair any damaged areas by cutting patches of vapor retarder material, overlapping damaged area at least 6" into undamaged material and taping all sides.

END OF SECTION

SECTION 07 52 00
MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Multi-ply modified bitumen roofing system consisting of three membrane interplays and a mineral surfaced fire rated cap sheet.
   2. Hot mopped to an approved rigid insulation substrate.
   3. Mechanically attached to an approved lightweight concrete substrate. Provide pull out testing for re-roofed area.
   4. Flashing material system by the roofing manufacturer for use with their roofing system.

1.3 REFERENCES

A. FS-HH–I–1972/GEN – Polyisocyanurate Insulation
B. ASTM D41 – Standard Specification for Asphalt Primer for Used in Roofing, Damp-proofing, and Waterproofing
C. ASTM D312 – Standard Specification for Asphalt Used in Roofing
D. ASTM D2178 – Standard Specification for Asphalt-Impregnated Glass Felt used in Roofing and Waterproofing
E. ASTM D2842 – Standard Test Method for Water absorption of Rigid Cellular Plastics
F. ASTM E96 – Standard Test Method for Water Vapor Transmission of Materials
G. ASTM E108 Standard Test Methods for Fire Test of Roof Coverings
H. ASCE 7 – Minimum Design Loads for Buildings and Other Structures
I. NRCA – Roofing and Waterproofing Manual, Current Edition
J. UL – Fire Hazard Classifications
K. UL – Roofing System & Material Guide
L. Florida Building Code (FBC)
M. FM – FM Listing: Provide built-up roofing, base flashing, and component materials that comply with requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for class 1 or noncombustible construction, as applicable. Identify materials with FM markings.
   1. Roofing system shall comply with the following:
   2. Fire/Windstorm Classification: Class 1A-90 and FM-1-90 wind uplift resistance, or as required to resist requirements of Florida Building Code, whichever is greater.
N. LEED for Schools by USGBC

1.4 SUBMITTALS

A. Product Data: Submit specifications, installation instructions, and general recommendations from manufacturers of roofing system materials, for type of roofing required.
   1. Include data substantiating that materials comply with requirements, including list of materials proposed for use and manufacturer's product data sheets for other products.
   2. Provide sample copies of specified warranties, including evidence of application for warranty from manufacturer.
   3. Include complete Manufacturers instructions for periodic inspection and maintenance of roofing system in closeout documentation.
   4. Albedo data: Provide information identifying the (SRI) solar reflectance of the following products provided under work of this Section.
   5. Emissivity data: Provide information identifying the emmissivity of the following products provided under work of this Section:
      a. Roofing
   6. Energy Efficiency:
      a. Submit documentation for Energy Star qualifications for products provided under work of this Section.

B. Shop Drawings: Submit complete installation details showing roof configuration, sheet layout, seam locations, flashing, roof slopes, details at each different perimeter condition and special conditions.
   1. Provide fastening pattern layout in compliance with ASCE 7.
   2. Provide a copy of product approval for the system, per FBC requirements.

C. Samples: Submit 12" x 12" square of membrane system.

D. Certificates included with closeout documents:
   1. Submit Manufacturers certification that materials and components furnished conform to specified requirements and that materials furnished are compatible for decks indicated.
   2. At completion of work, submit Manufacturers certification that roofing system installation is in accordance with Manufacturers warranty requirements.

E. Safety Provisions:
   1. Submit a complete detailed schedule of special safety provisions implemented to insure the health and safety of the people.
   2. Work shall not start without the Owner’s agreement of the following provisions:
      a. A plan on how to maintain the school’s existing exits and fire protection systems during construction;
      b. A plan for a dust free operation;
      c. A plan for the sequencing of work and the removal of debris from the site during and after construction.
      d. A fall protection plan indicating the contractor plans for complying with OSHA’s requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain primary roofing materials from a single manufacturer, with at least 10-years of documented experience in the roofing material business.

B. Installer: Shall be a Company specializing in installation of bituminous roofing, minimum five-years of continuous documented experience operating under the same name, with extensive experience in the application of roofs of similar size and type, and approved in writing by manufacturer of accepted roofing system.
   1. The job supervisor shall have minimum 5-years of documented experience in supervising projects of this size and scope.

C. All work shall conform to NRCA Roofing and Waterproofing Manual, Florida Building Code, FEEC, and to manufacturers' instructions.
D. Requirements of Regulatory Agencies:
   1. Underwriter's Laboratories, Inc.: Class A fire hazard classification.
   2. Roofing system shall meet current ASCE 7 wind requirements for the roofing system.
E. Pre-Installation Conference:
   1. Prior to installation of roofing system, conduct a pre-installation site conference after submittal approval.
   2. Attendance: Owners Representative, Building Department Representative, Architect, Contractor, Job Superintendent, Subcontractors, and Manufacturer's Representative related to roofing work.
   3. Agenda: Review project conditions, application, coordination with other work, and protection of completed roofing.
F. Inspections:
   1. Provide on-site weekly inspections by Owner's representative during and after installation of roofing system.
   2. Provided by the Building Department as necessary to assure proper installation of the roofing system.
G. Albedo:
   1. Low sloped: Initial Solar Reflectance greater than or equal to 0.78. Maintenance of Solar Reflectance greater than or equal to 0.50 three years after installation under normal conditions.
H. Emissivity:
   1. Provide minimum 0.9 emissivity as tested in accordance with ASTM E408.
I. Energy Efficiency:
   1. Provide Energy Star labeled roofing systems.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible, including required fire resistance classification labels.
B. Store and handle material per manufacturer's requirements.
C. Store rolled goods on end on clean raised platforms with a breathable weather protective covering, such as canvas, when stored outdoors (Polyethylene or other non-breathable plastic coverings are not acceptable).
D. Provide continuous protection of materials against wetting and absorption; remove wet materials from project site.
E. Rooftop Storage: Disperse material evenly across the roof to avoid concentrated loading.

1.7 PROJECT CONDITIONS

A. Proceed with roofing work only if existing and forecasted weather conditions permit work in accordance with manufacturers' recommendations and warranty requirements.
B. Do not apply roofing membrane to damp deck surface.

1.8 WARRANTIES

A. Installer's Warranty: Provide written warranty signed by the roofing Installer and the Contractor agreeing to replace or repair defective components and workmanship of the total roofing system, including roofing membrane, flashing, insulation and roofing accessories as required to

maintain the total roofing system in a watertight condition at no expense to the Owner, for a period of two-years after the date of substantial completion of the entire Project.

B. Manufacturer's Warranty: Provide written warranty signed by the Manufacturer of the primary roofing materials agreeing to replace or repair defective roof membrane and flashing materials and workmanship as required to maintain the roofing system in a watertight condition at no expense to the Owner for a period of 20-years after date of substantial completion of the entire Project. In addition provide written warranty signed by the manufacturer of primary roofing materials agreeing to allow Owner to make emergency repairs to roof without voiding manufacturer's warranty.
   1. In conjunction with issuance of the above warranty, include.
      a. Instructions detailing preventative maintenance required to maintain the warranty.
      b. List of substances, which may damage the membrane.
      c. Specifications on repair of the membrane Owner may do without voiding warranty.
   2. Warranty shall include coverage for damage to building resulting from failure of roof system to resist penetration of water with no dollar limit to the value of repairs or replacements covered.
   3. The built-up roofing membranes and lightweight insulation as well as all accessories and appurtenances shall comprise the "Roofing System" and shall be part of a single source warranty.
C. Provide on-site inspections by Owner's representative during installation of roofing.
D. Manufacturer's Certification: Submit written certification signed by the manufacturer stating that the roofing system manufacturer will provide warranties, inspection and Report Services specified herein. NOTE: Warranty terms shall be submitted with the post-bid package.
E. Provide acceptance letter from the roofing manufacturer that this specification meets the requirements of the 20-year warranty and that no criteria specified herein will impact such warranty.

PART 2 PRODUCTS

2.1 ROOFING SYSTEM

A. Approved Source Manufacturers: Provide one of the following modified roofing membrane systems with asphalt bitumen and modified bitumen granule cap sheet, modified to meet the characteristics specified herein if required.
   1. Rigid Substrate: GAF, Ruberoid M.B. Roofing System I-3-1-MGPFR
   2. Rigid Substrate: Manville, 4CID-FR
   3. Rigid Substrate: Soprema, 3VI-1073
   4. Lightweight Substrate: GAF, Ruberoid M.B. Roofing System I-3-1-MGPFR
   5. Lightweight Substrate: Manville, 4CLD-FR
   6. Lightweight SUBSTRATE: Soprema 3VI-1073
   7. Soprema, Sopralene or Elastophene system equal to the GAF and Manville system upon approval.
   8. Other pre-approved equal.
B. Membrane Characteristics: Three-layers of inter-ply felt sheets and mineral surfaced cap sheet.
   1. Cap sheet shall have minimum solar reflectance index (SRI) of 78.
      a. New is required
      b. Replacement is highly desirable and requires District approval if less than 78.
   2. Roof covering shall be Class A fire rating
   3. Three-Modified Inter-ply Membrane Sheets: Premium, asphalt coated, fiberglass base sheet, ASTM D2178, Type VI

4. One-Modified Bitumen Cap Sheet: A fire resistant, premium, fiberglass/polyester composite reinforced, granular surfaced, modified bitumen cap sheet, per ASTM D6162, Type II or Type III
5. Primer: ASTM D 41
6. Roofing Cement: ASTM D 4586, asbestos-free.
7. Mineral Granules: Size No. 11 ceramic, white in color, free of fines and dust, unaffected by airborne acids and ultraviolet radiation
8. With pre-approval from the District and Architect, may substitute:
   20-year 3-ply system, such as Manville 3CID-FR for rigid substrate; or
   CLD-FR for lightweight substrate; or
   Soprema 02-25 (42), (44), or (47) for lightweight substrate; or
   Soprema 32S (55), (48), or (54) for rigid substrate

2.2 ACCESSORIES

A. Roof System Vents: Manufacturer's standard spun aluminum one-way venting.
B. Fiber Cants: Fire rated, asphalt impregnated, wood fiberboard, pre-formed to greater than a 45° angle, (4" face minimum) fastened with roofing mastic.
C. Curb Mounted Expansion Joint: Sheet EPDM reinforced with closed cell urethane backing.
D. Exterior Expansion Joint Covers: Manville Expando-O-Flash at roof and Expando-O-Guard at exterior vertical and horizontal wall surfaces or equal.

2.3 LIGHTWEIGHT CONCRETE INSULATION

A. Lightweight Concrete Insulation: Provide Zonolite Vermiculite Aggregate cellular insulating concrete with insulperm insulation board, stair stepped as required by Siplast Construction Products.
   1. Acceptable equals are products by Elastizell, Celcore, or Concrecel.
      a. Insulation thickness as shown on drawings to a minimum of 2” at all roof drains shall provide a minimum average roof R-Value of 20.
B. Fastening Devices: Provide membrane manufacturers' insulation fastening system of appropriate size and nailing pattern as designed and tested in the Product Approval documents.
C. Provide vented deck system for lightweight concrete.

PART 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Do not start the installation of accessories or membrane without the presence of the Manufacturer's Technical Representative. This requirement shall not be waived.
   1. Due to the incompatibility of various materials with the roofing membrane, the Representative shall inspect the substrate and shall have a barrier applied for complete separation and protection of the roofing membrane and accessories.
B. Install all vents, drains, curbs, nailers, blocking, insulation, and projections through the roof before starting membrane installation.
   1. These items may be installed after the membrane installation only with Architect’s written approval, proper provision for re-inspection, and continued warranty protection.

3.2 PREPARATION OF SUBSTRATE

A. Insulation:

1. The applicator shall carefully inspect all surfaces to receive insulation and assure all surfaces are satisfactory prior to beginning installation.
2. Beginning insulation installation constitutes acceptance of substrate without recourse.

B. Roofing Membrane: The manufacturer's Technical Service Representative shall carefully inspect the substrate receiving the roofing and provide a written report.
C. Install all nails, blocking, vertical surfaces, etc. prior to proceeding with membrane installation.
D. Verify that all units are properly secured in place prior to proceeding with membrane installation.

3.3 LIGHTWEIGHT CONCRETE INSTALLATIONS

A. Slurry: Cover the metal deck with a ⅛" inch slurry coat of the lightweight insulating fill.
B. Insulation Board: Place the insulation board in the ⅛" slurry coat.
   1. Place the insulation board within 30 minutes of slurry coat placement.
   2. Place the insulation board in a manner that provides full contact of slurry to board.
   3. Install the insulation board in a stair-stepped configuration to achieve the minimum ⅛" per foot slope.
C. Lightweight Insulating Fill: Within 4 hours of insulation board placement, install a minimum of 2" of lightweight insulating fill over the insulation board, screened to an even surface for the receive the roofing membrane.
D. Do not install more insulation each day than can be covered with a watertight cover before end of day or start of inclement weather.
E. Vent insulation board to roof edges as recommended by manufacturer.

3.4 INSTALLATION OF ROOFING MEMBRANE SYSTEM & LIGHTWEIGHT CONCRETE

A. Install in accordance with accepted roofing manufacturer's specification and recommendations, and as specified below.
   1. Phased construction of roofing membrane is strictly prohibited.
B. Apply one-base sheet mechanically, two-glass felts, and one-mineral surfaced cap sheet over cellular lightweight insulating concrete system.
   1. Mechanically attach the base sheet to the new lightweight concrete deck in a pattern to meet ASCE 7 as per manufacturer recommendations and the Product Approvals for wind uplift classification, minimum 140 mph or as specified by structural engineer.
   2. Felt sheet membrane application:
      a. Remove the roll wrapping tape and labels before membrane installation.
      b. Unroll first roll of membrane completely and align.
         i) Unroll remaining rolls approximately halfway in order to align the side laps and maintain the required end lap.
         ii) Installation shall start at the lowest point and continue in a shingle method.
      c. Re-roll one end of the roll, approximately half way to facilitate alignment.
      d. Broom all plies in coal tar and lap 24¾", so that in no place shall felt touch felt.
      e. Roll up the un-adhered half of the membrane sheet and repeat the above procedure to complete the installation of the roll.
      f. Apply membrane: seal seams, ends, and permanently waterproof.
      g. Apply membrane smooth, free from air pockets, wrinkles, or tears.
      h. Extend membrane up cant strips a minimum of 4" onto vertical surfaces.
      i. Seal membrane around roof penetrations.
      j. Keep rooftop traffic to a minimum shortly after installation of membrane in order to minimize damage.
C. Complete installation of modified roofing system up to line of termination of day's work.

1. Install temporary water cut-offs of plastic cement and base sheet strips at end of each day's work.
2. Remove upon resumption of work.

D. Base Flashing:
1. Install in accordance with requirements of roofing system manufacturer.
2. Install where roofing system abuts vertical surfaces and at other locations detailed.

E. Roof Edging:
1. Prior to application of metal edging treatment, extend roofing felts up over tapered edging and secure to wood nailer with base felt extended and folded back over ply felts.
2. After metal edging is in place, flash as recommended by roofing manufacturer.

F. Flashings: Install metal flashings in such a manner as to prevent leaks.

G. Venting: Provide aluminum one-way vent stacks for every 900 s.f. of roof area or as recommended by manufacturer.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide periodic inspections of roof application by qualified technical representative of roofing manufacturer.

3.6 CLEANING

A. Clean up debris, excess materials, and equipment and remove from site.
B. Remove bitumen from surfaces other than those requiring bituminous roof coatings.
C. Remove bituminous markings from finished surfaces.

3.7 PROTECTION

A. Provide special protection or avoid heavy traffic on completed work when ambient temperature is above 80°F.
B. Restore to original condition or replace work or materials damaged during handling of bitumen and roofing materials.
C. Do not transverse any walkways where new work has been completed where traffic must continue over finished roof membrane, protect surfaces.
D. Do not throw or drop debris from roof, use chutes, or high lift trucks.

3.8 SITE ENVIRONMENTAL PROCEDURES:

A. Waste Management: As specified and as follows:
1. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacture for recycling into new product.

END OF SECTION

SECTION 07 60 00
FLASHING, GUTTERS, DOWNSPOUTS, AND OTHER ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to
   1. Shop or field-formed sheet metal work for moisture protection
   2. Miscellaneous sheet metal accessories

1.3 QUALITY ASSURANCE

A. All welding personnel affiliated with the site construction shall be approved certified welders and shall supply certified welding certificates to the School Board Project Facility Manager prior to commencing work.
B. Applicator/Installer shall be a company specializing in sheet metal flashing work with minimum 5 years experience.
C. Job supervisor shall have minimum 5-years of documented trade experience in supervision on projects of this size and type.
D. Except as otherwise indicated, the workmanship of sheet metal work, method for forming joints, anchoring, cleating, and provisions for expansion shall conform to the standard details and recommendations of the Copper Development Association and the "Architectural Sheet Metal Manual" published by SMACNA; and workmanship shall be of the best quality, in accordance with best trade practice and the recommendations and specifications of the Sheet Metal and Air Conditioning Contractors National Association, Inc.
E. High performance edge details must be selected from manufacturers who certify performance to meet design requirements, based upon testing of such products using the test methodologies RE-1, RE-2, and/or RE-3 as referenced by the SPRI Wind Design Guide for use with Low Slope Roofing". Other designs may be used, provided they are tested and certified to meet wind resistance and termination tests established for the projects building height, ground roughness factor, local wind speeds, and geographic location.
   1. Uplift requirements shall match requirements specified for adjacent membrane roofing.
   2. Wind resistance calculation will be designed specifically for the current project.

1.4 REFERENCES

A. AISC – Stainless Steel, Uses in Architecture
B. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
C. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D. ASTM B32 – Standard Specification for Solder Metal
E. ASTM B101 – Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction
F. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
G. ASTM B370 – Standard Specification for Copper Sheet and Strip for Building Construction
H. ASTM B813 – Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
I. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
J. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free
K. FED A-A-51145 – Flux, Soldering, Non-Electronic Paste and Liquid
L. NRCA (National Roofing Contractors Association) – Roofing Manual
M. SMACNA – Architectural Sheet Metal Manual
N. FBC – Florida Building Code

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
   1. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials: *(Provide materials extracted/harvested and manufactured within a 500 mile radius from the project site).*
      a. Sourcing Location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing Location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s): Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
   3. Albedo Data: Provide information identifying the SRI and solar reflectance of the following products provided under work of this Section:
      a. Roofing
   4. Energy Efficiency:
      a. Submit documentation for Energy Star qualifications for products provided under work of this Section.
B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

C. Operating and Maintenance Manuals Submittals:
   1. Verify that plastic products to be incorporated into the Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance manual.
      a. Type 1: Polyethylene Terephthalate (PET, PETE).
      b. Type 2: High Density Polyethylene (HDPE).
      c. Type 3: Vinyl Polyvinyl Chloride (PVC).
      d. Type 4: Low Density Polyethylene (LDPE).
      e. Type 5: Polypropylene (PP).
      f. Type 6: Polystyrene (PS).
      g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

D. Documentation of manufacturer's take-back program for insulation materials. Coordinate with construction waste management. Include the following:
   1. Appropriate contact information.
   2. Overview of procedures.
   3. Limitation and conditions, if any, applicable to the project.

E. Samples: Submit 8" square samples of specified sheet materials exposed as finished surfaces.
   1. Submit 12" long, completely finished units of specified factory-fabricated products.

F. Shop Drawings: Submit shop drawings showing layout, joining, profiles and anchorages of fabricated work, including but not limited to counter-flashings, gravel stops, trim/fascia units, gutters, downspouts, scuppers, and expansion joint systems.

G. Provide FBC product approval if system is not covered in the product approval for roof covering.

PART 2 PRODUCTS

2.1 FLASHING, GUTTERS, DOWNSPOUTS, and OTHER ACCESSORIES

A. Sheet Metal Flashing/Trim:
   1. Aluminum Sheet: Commercial quality, ASTM B209, 6063-T5 alloy, mill finish, shop pre-coated, 0.0239" thick (24-gauge) except as otherwise indicated.
   2. Stainless Steel: ASTM A167, Type 304, soft temper; smooth patterned finish.

B. Sheet Metal Gutters
   1. Form gutters as long as possible, but not less than 10' in length complete with end pieces, outlet tubes, and special pieces that may be as required. Join sections with riveted or sealed joints.
   2. Keep joints to minimum, but any joint that is required, rivet and seal.

C. Provide prefinished gutters and downspouts in shapes and sizes indicated, with mitered and welded corners. Include straps, hangers or other attachment devices; end plates; elbows; fittings; and trim and other accessories indicated or required for complete installation. Fabricate gutters in 10 foot long sections minimum with 6 inch wide concealed splice plates. Color to be selected by Architect.

D. Additional Features: Provide items below fabricated from the same metal as gutters and downspouts.
   1. Fabricate collection/conductor boxes of same prefinished material thickness and finish as gutters. Provide profile indicated and comply with SMACNA Fig. 1-25, or as indicated on Drawings.

E. Provide gutters fabricated from the following metal:
   1. Formed aluminum sheet
      a. Thickness: 0.063 inch (up to 30 inch girth).
F. Provide closed face downspouts fabricated from Vent Stack Flashing:
   1. Preformed stainless steel vent extensions with a vandal proof cap.
G. Accessories
   1. Gutter straps and brackets of same prefinished material as gutters and downspouts.
   2. 1/4 inch thick by 1 inch wide aluminum (up to 20 inch girth).
   3. Downspout Hangers: 1/8 inch thick by 2 inches wide of same material as downspout.
   4. Stainless Steel Wire Strainer: 14 gauge, removable basket type strainer similar to SMACNA Fig. 1-24D.
   5. Expansion Joints: Provide where indicated but not more than 50 feet on center maximum. Comply with SMACNA Fig. 1-6 and Fig. 1-7.
   6. Flashing height prior to ordering/installation to comply with the plans.
H. Finish: All aluminum flashing, trim, gutters, and downspout guards shall be bronze finish.
I. Prefabricated Reglets and Counterflashings: "Fry Springlok Flashing System"; Fry Reglet Corporation, Alhambra, CA, or Metal-Era 2-pc Snap-In Counter Flashing, Metal-Era, Inc., Waukesha, Wisconsin. Reglet shall have a 2 inch factory-formed end lap; flashing shall have a 3 inch end lap. Provide factory manufactured mitered and sealed corners.
   1. Surface mounted for use with concrete or masonry substrate, unless indicated otherwise. Factory punched slots shall be located on 12 inch centers and allow for expansion. System requires sealant at time of installation. Refer to Specification Section 07 92 00 - Joint Sealants.
      a. Product: Type SM - Surface Mounted (Expan-O-Seal).
      b. Product: CFW2-500 - Surface Mounted Counter Flashing.
J. Reglets and Counter-flashings: Shall be prefabricated, 24-gauge with factory mitered corners.
   1. Provide continuous foam backer rod and elastomeric sealant where shown.
K. Miscellaneous Materials and Accessories:
   1. Solder: Provide approved sheet metal compatible lead free solder with resin flux.
   2. Fasteners: Stainless Steel or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
   3. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
   4. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.
   5. Roofing Cement: ASTM D4586 with no asbestos.
   6. Master Sealant: For slipping joints in flashings shall be polyisobutylene and be non-hardening, non-migrating, non-skinning, and non-drying.
   7. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15-mil.
L. Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by flexible flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
   1. Flexible Tubing: Tube with flexible flashing shall be equal to B.F. Goodrich. The tube shall be made from closed cell synthetic rubber foam.
   2. Water barrier (vapor barrier) under cradle to expansion joint shall be equal to B.F. Goodrich's 20 mil "Lexsuco" PVC.

M. Roof Drains
   1. Cast Iron: Parapet/Scupper Roof Drains
      a. Shall be as manufactured by Wade Division/Tyler Pipe, Tyler, Texas; sizes as indicated.
         i) Roof drains shall be Wade W-3270 Series.
         ii) Products of Blake, Josam, Smith, Zurn, Portals Plus, and Watts Drainage Products will be acceptable, providing they can meet or exceed the above standards.
      b. Construction: Cast iron body with flange, flashing ring with integral gravel stop, adjustable extension ring, noncorrosive clamping units hinged to body, cast iron mushroom type dome strainer, and deck clamp.
   2. Cast Iron: Roof Drains
      a. Shall be as manufactured by Wade Division/Tyler Pipe, Tyler, Texas; sizes as indicated.
         i) Roof drains shall be Wade W-3000 Series.
         ii) Products of Blake, Josam, Smith, Zurn, Portals Plus, and Watts Drainage Products will be acceptable, providing they can meet or exceed the above standards.
      b. Construction: Cast iron body with flange, flashing clamp with angled grate strainer.

2.2 FABRICATED UNITS

A. Shop-fabricate work to greatest extent possible.
B. Comply with details shown and with applicable requirements of SMACNA Architectural Sheet Metal Manual.
C. Form the work to fit substrates, and comply with material manufacturer instructions and recommendations for forming material.
D. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated with exposed edges folded back to form hems.
E. Fabricate non-moving seams in sheet metal with flat-lock seams.
   1. For metal other than aluminum, on seamed tin edges form seams and solder.
   2. After soldering, remove flux and wash joints clean.
F. When movable expansion type joints indicated on plans or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

2.3 ACCESSORIES

A. Splash Pads: Provide and install precast concrete type, of sizes and profiles indicated; minimum 3000 psi at 28 days, with minimum 5% air entrainment.

2.4 PREFABRICATED COPING

A. Interlocking Multi-Part Coping System: Manufacturer's standard system consisting of coping formed from (0.050, 0.063 or 0.080 inch thick aluminum sheet) aluminum gutter chair or gutter/splice plate or compression pad/gutter; with prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners.
   1. Products: Subject to compliance with requirements, include one of the following:
      a. "Permasnap Coping"; Hickman, Asheville, North Carolina.

b. "Perma-Tite Coping"; Metal-Era, Waukesha, Wisconsin.
c. "Snap-Lock Coping"; MM Systems Corp., Tucker, Georgia.
d. “Type AP Snap-Tight Coping"; Architectural Products, Covington, Kentucky (aluminum only).
e. "Quick Snap Coping"; Alloy Architectural Products.

2. Materials:
   a. .063 inch aluminum.
   b. 20 gauge galvanized steel.

2.5 PREFABRICATED FASCIA AND GRAVEL STOP SYSTEMS

A. Fascia for Built-Up Roofing: Manufacturer's standard system consisting of extruded or formed aluminum compression clamp and minimum 24 gauge, formed, zinc-coated steel water dam/hold-down clip; of profile and fascia height indicated; with water dam and clamp of proper configuration and size for type of roofing system indicated on drawings; with concealed splice plates.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Formed Fascias
         i) “Presto Stop Gravel Stop", Johns Manville, Denver, Colorado
   2. Accessories: Provide manufacturer's standard accessories of the following type, designed and manufactured to match and fit to fascia system indicated:
      a. Prefabricated corner units for both inside and outside corners, with miters welded in factory prior to finishing.
      b. Extruded fascia extenders of profile and size indicated.
      c. Soffit closure/clips.
      d. Downspout starters (fascia sump) with downspout starter hole.
         i) Provide stainless steel core.
         ii) Overflow scupper with prefabricated core.
         iii) Spillout scupper with prefabricated core.
   3. Material:
      a. 063 inch extruded aluminum, Kynar 500 finish to match existing.

2.6 DOWNSPOUT TRANSITION LEADERS

A. Downspout transition leaders shall be manufactured by Neenah Foundary Company, Neenah, Wisconsin, or equal as approved by Architect.
B. Cast iron type “B” offset downspout transition leader with rectangular opening at top to match downspout and round opening at bottom to match drainage pipe.
   1. Downspout transition leader shall be finished to match downspout.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.
B. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners and set units true to line and level as indicated.
C. Install work with laps, joints and seams that will be permanently watertight and weatherproof.

Drip edge flashing shall be provided with concealed splice plates for joints 10' o. c.

D. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproofing performance.
E. Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contract, with bituminous coating to other permanent separation as recommended by manufacturer/fabricator.
F. Install reglets to receive counter-flashing in manner and by methods recommended by manufacturer.
G. Install counter-flashing in reglets by snap-in seal arrangement.
H. Install elastic flashing in accordance with manufacturers' recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
I. Prefabricated Coping
    1. Install as recommended by manufacturer and as indicated.
    2. Provide splice plates, cover plates and other items necessary for complete installation.
    3. Install according to best standard practices, with continuous hold down clips at 36"on center.
    4. Miter joints.
    5. Provide expansion and slip joints every 20 feet of straight length and joints with appropriate sealant of matching color.
    6. Do not face nail sections.
J. Gutters and Downspouts
    1. For nonmoving seams, clean edges and lap seams one inch. Seal seams with epoxy seam sealer and rivet on 2 inch centers. Provide expansion joints between downspouts.
    2. Install gutter straps and brackets at 36 inches on center, alternating strap and bracket.
    3. Provide premanufactured outlet tube sections extending 3 inches into downspouts. Provide in each outlet tube a wire strainer of the removable basket type. Fit strainer snugly into outlets.
    4. Fasten downspouts to walls with straps and secure with noncorrosive screws in lead sleeves. Extend downspouts into cast iron drains and seal with grout.

3.2 CLEANING AND PROTECTION

A. Clean all exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
B. Provide for surveillance and protection of flashings and sheet metal work during construction, to ensure the work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION

SECTION 07 84 00
FIRESTOP SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Applications of Firestop systems include:
      a. Penetrations for passage of duct, cable tray, conduit, piping, electrical busways and raceways through fire rated vertical barriers (walls and partitions), horizontal beams (floor/ceiling assemblies) and vertical service shaft walls and partitions.
      b. Gaps between tops of walls and ceiling or roof assemblies.
      c. Expansion joints in fire rated walls and floors.
      d. Openings and penetrations in fire rated partitions or walls containing fire doors.
      e. Openings around structural membranes which penetrate fire rated floors or walls.

1.3 REFERENCES

A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
B. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials.
C. ASTM E814 – Standard Test Method of Fire Tests of Through Penetration Firestops
D. FM (Factory Mutual) - Fire Hazard Classifications.
E. UL – Fire Hazard Classifications
F. UL 263 – Fire Tests of Building Construction and Materials
G. UL 723 – Test for Surface Burning Characteristics of Building Materials.
H. UL 1479 – Fire Tests of Through-Penetration Firestops
I. WH (Warnock Hersey) - Certification Listings.
J. Florida Building Code.
K. Firestop Contractors International Association (F.C.I.A):
   1. M.O.P. Manual of Practice
L. International Firestop Council (IFC):
   1. Ref. 1 Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments (April 2001)
   2. Ref. 2 Inspectors Field Pocket Guide
M. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electric Code
   2. NFPA 101 - Life Safety Code
   3. NFPA 221 - Fire Walls and Fire Barriers (preliminary to be released)
   4. NFPA 251 - Fire Tests of Building Construction and Materials
N. American Society for Testing and Materials (ASTM).
   1. E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F
   2. E 814 Fire Tests of Through-Penetration Fire Stops

3. E 1399 Cyclic Movement and Measuring Minimum and Maximum Joint Widths
4. E 1966 Test Method for Resistance of Building Joint
5. E 2174 Standard Practice for On-Site Inspection of Installed Fire Stops
6. E 05.11.14 Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA); ASTM permanent number assignment pending approval of Draft

O. UL 2079 Tests for Fire Resistance of Building Joint Systems

1.4 DEFINITION

A. Firestopping: A code approved material or assembly placed in spaces between building materials to arrest the spread of smoke, heat, gases, or fire through wall or floor openings.

1.5 SYSTEM DESCRIPTION

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated as determined per ASTM E814, UL 1479 but not less than that equaling or exceeding the fire resistance rating of the constructions penetrated.
C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where specified by codes or where the following conditions exist:
   1. Where firestop systems protect penetrations located outside of wall cavities.
   2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
   3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature rise rating.
   4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 square inch in overall cross sectional area.
D. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per ASTM E119, UL 1479 and UL 2079 but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.
E. For firestopping exposed to traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions and will meet load requirements.
   1. For piping penetrations for plumbing and wet pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not required removal of insulation.
F. For through-penetration firestop systems exposed to view, provide products with flame spread of less than 25 and smoke developed ratings of less than 450, as determined per ASTM E 84.
G. Firestopping Materials: ASTM E119, ASTM E814, UL 263 or UL 1479 to achieve fire rating.

1.6 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00.

B. Product Data:
   1. Materials list of items used under this Section.
   2. Provide the manufacturer's specifications and data.
   3. Shop Drawings:
      a. Submit shop drawings showing layout, profiles, and product components.
      b. Include Independent laboratory with system classification number on shop drawings.
   4. Provide written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of references for verification.
   5. Certification from sealant manufacturers that their products are suitable for the use indicated and comply with specification requirements.

1.7 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
B. Applicator Qualifications:
   1. Applicator shall have at least 3-years experience in installing materials of types specified and shall have successfully completed at least 3-projects of similar scope and complexity.
   2. Manufacturer approved applicator.
   3. Applicator shall designate a single individual as project supervisor who shall be on site at all times during installation.
C. Single source responsibility for firestopping materials:
   1. Obtain Firestop materials from single manufacturer for each different product required.
   2. Manufacturer shall instruct applicator in procedures for each material.
D. Regulatory Requirements:
   1. Firestop System installation shall meet requirements of ASTM E-814 and provide a fire-rating equal to that of the construction it penetrates.
   2. Proposed Firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
   3. For those Firestop applications not having an UL or third party tested system available through any manufacturer.
      a. Prior to installation the manufacturer may submit to the authorities having jurisdiction for their consideration an engineering judgment derived from similar independently tested system of similar design.
      b. Manufacturer's engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.8 MOCKUP

A. Provide mockups of applied Firestop assemblies under provisions of Section 01 40 00.
B. Apply 3 sq. ft. to a representative substrate surface.
C. Apply Firestop material to a representative penetrated masonry, concrete, stud wall, and substrate.
D. If accepted, mockup will demonstrate minimum standard of the Work.
E. Mockup may remain as part of the Work.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60°F.

B. Maintain this minimum temperature before, during and three days after installation of materials.
C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products by one of the following:
   1. Hilti Construction Chemicals, Tulsa, Oklahoma
   2. Specified Technologies, Inc., (STI), Sommerville, New Jersey
   3. 3M Fire Protection Products, St. Paul, Minnesota
   4. The Rectorseal Corporation, Houston, Texas
   5. Tremco, Inc., Beachwood, Ohio
   6. Nelson Firestop Products, Tulsa, Oklahoma

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
   1. All materials shall comply with ASTM E814 or E119 (UL 1429), and shall be manufactured of nontoxic, nonhazardous, asbestos free materials, and unaffected by water or moisture when cured.
   2. Primers: Conform to manufacturer's recommendations for primers required for various substrates and conditions.
   3. Backup Materials: Backup materials, supports, and anchoring devices shall be provided as required by UL testing.
B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems. Accessories include but are not limited to the following items:
   1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
      a. Semirefractory fiber (mineral wool) insulation.
      b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
      c. Joint fillers for joint sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.3 FIRESTOPPING, MATERIALS

A. Use only firestopping products that have been UL 1479 or ASTM E814 tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

B. For penetrations by noncombustible items including steel pipe, copper pipe, rigid steel conduit, and electrical metallic tubing (EMT), the following materials are acceptable:
   1. Hilti FS 601 Elastomeric Firestop Sealant or FS-ONE High Performance Intumescent Firestop Sealant
   2. STI SpecSeal; Sealant SSS 100
   3. 3M; Fire Barrier CP25 or Firestop Sealant 2000
   4. The RectorSeal Corporation Metacaulk; 1000, 950, 835, Putty, & Mortar or Biofireshield K10 and K2 Mortar, Biostop 500+, Biotherm 100/200 & Biostop Putty.
   5. Tremco, Inc.; Tremstop Fyre-Sil Sealant
   6. Nelson; FSP putty, CLK caulk; LBC caulk
C. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems), the following materials are acceptable:
   1. STI; Wrap Strip SSW12
   2. Hilti; FS One Intumescent Firestop Sealant or CP 642 Firestop Jacket
   3. 3M; Fire Barrier FS-195 Wrap Strip or Fire Barrier CP 25
   4. Rector Seal; Metacaulk Wrap Strip, Firestop Collars, Metacaulk 1000, 950, & 835 or Biostop Wrap Strip, Collar, and Biostop 500+.
   5. Nelson; FSP putty; LBC caulk; PCS pipe choke; WRS wrap strip.
   6. Tremco; Tremstop WBM Intumescent Firestop Sealant.
D. For penetrations by combustible plastic pipe (open piping systems), the following material is acceptable:
   1. Hilti; CP 642 Firestop Jacket or FS-ONE High Performance Intumescent Firestop Sealant.
   2. 3M; Fire Barrier PPD Plastic Pipe Device.
   3. Nelson; PCS-Pipe Chokes; WRS-Wrap Strips; Nelson LBS (two inches and under).
E. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following materials are acceptable:
   1. STI; SpecSeal lightweight mortar SSM22B or putty.
   2. Hilti; FS635 Trowelable Firestop Compound or FIREBLOCK.
   3. 3M; Fire Barrier CS-195 Composite Sheet or Firestop Foam 2001.
   4. Rector Seal; Biofireshield K-10 & K2 Mortar or Metacaulk Firestop Mortar.
   5. Nelson: FSP putty; CLK N/S caulk; PLW pillow; CPS composite sheet; CMP – compound.
   6. Tremco; PS Pillow System.
F. For fire rated construction joints and other gaps with movement the following materials are acceptable:
   1. Hilti FS601 Elastomeric Firestop Sealant or FS 604 Self-Leveling Elastomeric Firestop Sealant.
   2. STI Pensil 300
   3. 3M; (Dow Corning Fire Stop Sealant 2000) or Fire Barrier CP 25.
   4. Tremco, Inc.; Tremstop Acrylic SP Sealant.
   5. Biofireshield, Biostop 700, Biostop 500+ or Metacaulk 1000 & 1100.
   6. Nelson: CLK caulk; LBC caulk; FSC Firestop Compound.
G. Provide a firestopping system with an "F" rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.
H. Provide a firestop system with an assembly rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration

firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.5 FIRE PREVENTION PILLOW SYSTEM

A. Intumescent fiberglass bags for sealing cable tray openings.

2.6 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
B. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:
   1. Verify substrate conditions, previously installed under other sections, are acceptable for product installation and product packaging instructions.
   2. Examine areas and conditions of work area and identify conditions detrimental to proper and timely completion.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material or other matter that may affect bond of firestopping material.
B. Verify that penetrations and joints are properly sized
C. Remove incompatible materials that may affect bond.
D. Do not proceed until unsatisfactory conditions have been corrected

3.3 INSTALLATION

A. Install material at walls or partition openings that contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
B. Apply primer and materials in accordance with manufacturer's instructions.
C. Apply firestopping material in sufficient thickness to achieve rating.
D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
E. Place intumescent coating in sufficient coats to achieve rating required.
F. Tool non-sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. Examine Firestop areas to ensure proper installation before concealing or enclosing areas.
B. Keep areas of work accessible until inspection by applicable code authorities.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   1. The words "Warning – Through-Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage".
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name

3.6 CLEANING

A. Clean work under provisions of Section 01 77 00.
B. Clean adjacent surfaces of firestopping materials.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 50 00.
B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. This Contractor shall furnish and install all joint sealers as shown on the drawings or herein specified, or both.
   2. This work includes all plant facilities, services, materials, labor, tools, and appliances as required.

1.3 REFERENCES

A. ACI 504 R – Guide to Joint Sealants for Concrete Structures
B. ASTM C834 – Standard Specification for Latex Sealants
C. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications
D. ASTM C920 – Standard Specification for Elastomeric Joint Sealants
E. ASTM C 1193 – Standard Guide for Use of Joint Sealants
F. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
G. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.
H. California South Coast Air Quality Management District (SCAQMD) #1168

1.4 JOB CONDITIONS

A. This Contractor shall inspect the job conditions as he finds them, and his starting of the work constitutes approval of all conditions.
B. Preparation of joint surfaces, backing, and the conditions under which the sealant and caulking is to be installed shall conform to manufacturer's recommendations.
   1. Use of bond break tape is prohibited without the expressed permission of the Architect. Each situation will be evaluated with regard to inability to properly use backer rod to prevent adhesion.
C. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
   2. When joint substrates are wet.
D. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

E. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.5 QUALITY ASSURANCE

A. All manufacturer items must be factory labeled, on the material or its container.
B. Manufacturer shall have a minimum of 10-years experience specializing in specified item.
C. Applicator shall be Sealant Manufacturer approved with 5-years successful experience.
   1. Applicator shall also agree to employ only skilled tradesmen for the Work.
D. Obtain elastomeric materials only from manufacturers that if requested, will send a qualified technical representative to the project site for advising the Installer of proper procedures and precautions for the use of the materials.
E. Contractor shall hold a pre-caulking meeting at the project site with the Architect and all involved parties to review conditions, materials, colors, and other requirements.

1.6 SUBMITTALS

A. Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of bond breakers, backer rods, and accessories.
   1. Submit full color samples for Architect selection.
B. Certificates from the manufacturers of joint sealants attesting that their products comply with the specification and are suitable for the use indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
B. Store and handle materials in compliance with manufacturer’s requirements to prevent their deterioration or damage due to moisture, temperature, contaminants, or other causes.

1.8 WARRANTY

A. The Contractor shall furnish written guarantee that work executed under this section is free from defects of material and workmanship for a period of 5-years from date of substantial completion of the entire project.
   1. Include coverage that he will immediately and at his own expense, repair and replace all such defects as may develop during the term of this guarantee.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with the requirements, provide products by one on the following:
   1. DAP, Inc., Dayton, Ohio
   2. Dow Corning Corp., Midland, Michigan
   3. General Electric Co., GE Silicones, Waterford, New York
   4. Mameco International, Inc., Cleveland, Ohio
   5. Pecora Corp., Harleysville, Pennsylvania

6. Rhone-Poulenc, Inc., Plymouth, New Jersey
7. Sonneborn Building Products Div., Minneapolis, Minnesota
8. Tremco, Inc., Beachwood, Ohio
9. Hilti Construction Chemicals, Tulsa, Oklahoma

B. Contractor may request other products or manufacturers for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product.
   1. The "Substitution Request Form" and complete technical data for evaluation must accompany requests for Architect's approval.
   2. All materials for evaluation must be received at least 10-days prior to bid due date.

C. Toxicity/IEQ:
   1. Comply with applicable regulations regarding toxic and hazardous materials, and as specified. Sealants must meet or exceed requirements of Bay Area Resources Board, reg. 8, rule 51.
   2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

D. Backer Rods: Provide composite backer rods.

2.2 MATERIALS

A. General
   1. The term “Acceptable Standard” when used within this Section, refers to the manufacturer and product listed, specified as to type and quality required for this project.
   2. Contractor shall supply a single resource responsibility for joint sealer materials.
      a. Obtain joint sealer materials from a single manufacturer for each different product required.
   3. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and final experience.

B. Caulking Compounds (Acrylic Latex Sealant)
   1. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer’s standard, one part, non-sag, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated for accepting paint. (Product recommended for exposed interior locations involving joint movement of less than 5%).
   2. Acceptable Standard
      a. “Sonolac”; Sonneborn Building Products, Inc.
      b. “Acrylic Latex Caulk 832”; Tremco, Inc.
      c. “Acrylic Latex Caulk with Silicone”; DAP
      d. “AC-20”; Pecora Corp.

C. One-Part Elastomeric Sealant (Silicone)
   1. One component elastomeric sealant complying with ASTM C 920, Class 25, Type NS (non-sag), unless manufacturer recommends Type S (self-leveling) for the application shown.(general caulking , glazing applications).
      a. Acceptable Standard
         i) “Pecora 864 Architectural Silicone Sealant; Pecora Corp.
         ii) “Dow Corning 791; Dow Corning Corp.
         iii) “Silpruf”: General Electric
         iv) “Omniseal”; Sonneborn Building Products, Inc.
         v) “Spectrem 2; Tremco, Inc.
   2. One component mildew resistant silicone sealant used around countertops, backsplashes, and other wet interior locations.

a. Acceptable Standard
i) "Rhodorsil 6B White"; Rhone-Poulenc, Inc.
ii) "Dow Corning 786", Dow Corning Corp.
iii) "Sanitary 1700"; General Electric

3. One-component high movement joints (+100/-50) use sealants in locations indicating high movement.
a. "Dow Corning 790"; Dow Corning Corp.
b. "Spectrem 1"; Tremco, Inc.

D. Elastomeric Sealants (Polyurethane) – Precast concrete & Tilt-Up Concrete Panels
1. One component polyurethane sealant, complying with ASTM C 920, Type S, Grade NS (non-sag), Class 25 (expansion and control joints, precast concrete panel joints, tilt-up concrete panel joints, perimeter caulking, flashing and sheet metal conditions).
a. Acceptable Standard
i) "Sonolastic NP 2"; Sonneborn Building Products, Inc.
ii) "Dymonic": Tremco, Inc.
iii) "Dynatrol I"; Pecora Corp.
iv) "Vulkem 921"; Mameco
v) "CS 2130"; Hilti
2. Multi- component polyurethane sealant, complying with ASTM C920, Type M, Grade N(non-sag)Class 25 (same uses as in previous item)
a. Acceptable Standard
i) "Sonolastic NP 2" Sonneborn Building Products, Inc.
ii) "Dymeric 511"; Tremco, Inc.
iii) "Dynatrol II"; Pecora Corp.
iv) "Vulkem 922"; Mameco
3. Multi-component epoxidized polyurethane sealant complying with ASTM C 920, Type M, Grade NS, Class A (same uses as described in item 1, also used on fire resistance rated joint design details.)
a. Acceptable Standard
i) "Dymeric"; Tremco, Inc.
ii) "DynaTrol II"; Pecora Corp.

E. One-part self-leveling polyurethane sealant (for traffic areas)
1. One component polyurethane self-leveling sealant, complying with ASTM C 920, Type S, Grade P, Class 25.
a. Acceptable Standard
i) "Sonolastic SL 1"; Sonneborn Building Products, Inc.
ii) "NR-201 Urexpan"; Pecora Corp.
iii) "Vulkem 45"; Mameco
2. Two component polyurethane self-leveling sealant, complying with ASTM C920, Type M, Grade P, Class 25.
a. Acceptable Standard
i) "Sonolaastic SL 2"; Sonneborn Building Products, Inc.
ii) "NR-200 Urexpan": Pecora Corp.
iii) "Vulkem 245"; Mameco
iv) "THC900/THC901": Tremco, Inc.

F. Flexible Polyurethane Security Sealant (for use on interior joints, perimeter of fixtures, penetrations, vents, doors, windows and similar openings)
1. Two component polyurethane sealant, complying with ASTM C 920, Grade NS, Class 12.5, with a Shore A Hardness of 55, Type M.
a. Acceptable Standard

i) "Dynaflex", Pecora Corp.
ii) "Ultra", Sonneborn Building Products, Inc.

G. Miscellaneous Materials
1. Provide joint cleaner and joint primer sealer as recommended by the sealant or caulking compound manufacturer.
2. Sealant backer rod shall be compressible rod stock, polyethylene foam; polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam, or other materials as recommended by sealant manufacturer.
a. Where plans indicate a 2" building expansion joint, provide an expanding foam secondary sealant, "BackerSeal" as manufactured by Emseal Joint Systems, Ltd., or Apolytite Standard as manufactured by Polytite Manufacturing Corporation, behind sealant in lieu of standard backer rod.
3. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer substrate tests and field tests.
4. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type acceptable to manufacturer of sealant and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in service performance.
5. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 EXECUTIONS

3.1 INSPECTION

A. This Contractor shall notify the General Contractor, when he has completed his work and is ready for A/E inspection.
B. Verify that substrate surfaces and joint openings are ready to receive work.
C. Verify that joint backing and release tapes are compatible with sealant.
D. Clean and prime all joints in accordance with manufacturer's instructions.
E. Remove loose materials and foreign matter that might impair adhesion of sealant.

3.2 INSTALLATION

A. Install all products in strict accordance to all manufacturers' recommendations.
B. Measure joint dimensions and size materials to achieve required width/depth ratios.
C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
F. Apply sealant within recommended application temperature ranges.
1. Consult manufacturer when sealant cannot be applied within ranges.
G. Tool joints concave.
H. Tilt-up concrete wall panel joints; clean joints free of moisture, dust, sealers and form release agents using a wire brush and rag with out solvents to clean concrete.
1. Exterior wall joints
a. Seal both sides (outside and inside) with an exterior joint system consisting of a foam-backer rod (set into the joint for the entire length of the joint cavity) and cover with a urethane or other acceptable joint sealant material (sealant depth should be one-half the joint width, max. ½" depth) tool joint material in place.

b. Protect sealant material during painting of walls.

2. Interior wall joints
   a. In fire resistance rated walls
      i) Seal both sides of joint with a fire-stopping sealant, encapsulating the ceramic blanket protection material, finish joint similar to that of the exterior wall joint described above.
   b. In non fire resistance rated walls
      i) Seal exposed concrete panel joints
      ii) Concealed (furred) concrete panel joints need not be sealed

3.3 ADJUSTMENT AND CLEANING

A. After installation, thoroughly clean all exposed surfaces and restore all damaged material to its original condition, or replaced with new material.

3.4 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Temporary ventilation: Provide temporary ventilation during work of this Section.
      a. Coordinate interior application of joint sealants with interior finishes schedules.

END OF SECTION

DIVISION 8

DOORS AND WINDOWS

SECTION 08 06 00

DOOR AND FRAME SCHEDULE NOTES AND LEGEND

1.1 General Notes and Legend

A. Legend

1.	AL	-	Aluminum
2.	GL	-	Glass
3.	HM	-	Hollow Metal - Steel
4.	SS	-	Stainless Steel
5.	STL	-	Steel
6.	WD	-	Wood

B. Fire Rating in Minutes

1.	20	-	20 Minute
2.	45	-	C Label 3/4 Hour (interior); E label 3/4 hour (exterior)
3.	60	-	B Label 1 Hour
4.	90	-	B Label 1-1/2 Hour (interior); D label 1-1/2 hour (exterior)
5.	180	-	A Label 3 Hour

C. Door sizes are indicated thus: 21070 (2'-10"W. x 7'-0"H.) Door sizes as shown on Door and Frame Schedule are nominal. Approved shop drawings must be distributed between trades to coordinate and verify actual door and frame sizes.

D. Door thickness shall be 1-3/4 inch, unless noted otherwise.

E. (HM) hollow metal doors and frames shall be as specified in Section 08 11 00 – Metal Doors and Frames.

F. Hardware sets indicated on schedule are specified under Section 08 71 00 – Door Hardware.

G. Type and thickness of glazing for doors and frames shall be as specified in Section 08 80 00 - Glazing.

H. UL frame anchors required for labeled openings.

I. For pairs of interior doors: Strictly maintain maximum 1/8 inch space between meeting edges of doors with or without metal channel edges.

J. For door and frame elevations see Drawing Sheet A-6.

K. Closers shall be the last hardware item installed. Installing Contractor shall verify maximum degree of door swing that field conditions will allow and install closers accordingly regardless of swing shown on Drawings.

L. Except when restricted by individual published listings, it is permissible for a fire door assembly to consist of the labeled, listed, or classified components of different organizations that are acceptable to the authority having jurisdiction.

M. Mullions listed in Section 08 71 00 – Door Hardware Schedule, shall be finished or painted to match aluminum or hollow metal frames.

N. Steel astragals and wood door metal vision light frame shall be painted. Color to be as selected by the Architect.

O. Provide knurled levers on all doors to hazardous areas. Tactile material is not acceptable.

P. Contractor shall provide shims for wall mounted wall stop/holders where the trim (pull, lever, or knobs) extend beyond the engaged depth of wall holder.

Q. Door specified with kickplates and vertical rod exit devices – cut kickplate short of vertical rod bottom latch case.

The following information has been noted on the Door and Frame Schedule under the remarks column:

2.1 Access control.

END OF SECTION

DOOR SCHEDULE
VERO BEACH HIGH SCHOOL - FRESHMAN LEARNING CENTER

OPENING NUMBER	DOOR			FRAME						FIRE RATING	HARDWARE		REMARKS NUMBER REFERS TO REMARK NOTES ON PAGE -
							DETAILS						
	SIZE	MAT.	TYPE	MAT.	TYPE	JAMB DEPTH	HEAD	JAMB	SILL OR THRESHOLD		SET NO.	KEYSIDE ROOM NO.	
151-1	(2)30710	AL/GL	A	AL	F3	5"	02/A-6	03A/A-6	04/A-6		1		2.1
152-1	(2)3070	WD	C	HM	F2	5 3/4"	05/A-6	06/A-6	07/A-6		2		2.1
152-2	(2)3070	WD	C	HM	F2	5 3/4"	08/A-6	09/A-6	10/A-6		3		
153-1	3070	WD	C	HM	F1	5 3/4"	05/A-6	06/A-6	07/A-6		5		
154-1	3070	WD	B	HM	F1	5 3/4"	08/A-6	09/A-6	10/A-6		4		

SECTION 08 11 00
METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Steel Doors and Frames

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People
B. ASCE 7 - Minimum Design Loads for Buildings and other Structures
C. ASTM A591/A591M - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
E. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus
F. ASTM E413 - Classification for Determination of Sound Transmission Class
G. ASTM E2074 - Standard Methods of Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
H. DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware
I. NFPA 80 - Fire Doors and Windows
J. NFPA 252 - Fire Tests for Door Assemblies
K. FBC - Florida Building Code
L. SDI-100 - Standard Steel Doors and Frames
M. UL 10B - Fire Tests for Door Assemblies
N. NFPA 80 - Doors in all smoke conditions

1.4 QUALITY ASSURANCE

A. Conform to requirements of SDI-100 and ANSI A117.1
B. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum of 3-years documented experience.
C. All exterior Door/Frame Assemblies shall meet current FBC Product Approval System requirements.
D. Coordinate hardware requirements with the District's card-reader system requirements.

1.5 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings, product data, manufacturer's literature, and installation instructions.
   1. Include details of each frame type, elevations of door design types, conditions at openings details of construction, location, and installation requirements of finish hardware and reinforcements and details of joints and connections.
B. Indicate door and frame configuration, anchor spacing, anchor types, location of cutouts for hardware and glazing, and internal reinforcement.
C. Provide hollow metal doors and frame assemblies that comply with performance requirements as demonstrated by testing manufacturer’s assemblies in accordance with ASCE 7.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Deliver doors and frames marked to identify doors with frames with openings.
B. Store doors and frame in a dry area on end with spacers between units to allow ventilation.
C. Ship and store frames with temporary stiffeners and spacers in place to prevent distortion.

1.7 WARRANTY

A. Provide minimum 5-year manufacturer's warranty under provisions of Section 01 77 00.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. CECO Doors
B. Fire Door Corporation
C. Curries Manufacturing, Inc.
D. Republic
E. Pre-Approved Equal.

2.2 STEEL DOORS

A. The following door types shall conform to the Steel Door Institute Standards as described in SDI 100-91.
B. Exterior Flush Type Doors
   1. Exterior doors shall be Grade III, 1-3/4 inch full flush extra heavy duty, 16 gauge galvanized (according to ASTM A525, G90, or ASTM A526), Model 2A, seamless edge design.
   2. Door face sheets shall be formed from one sheet of metal with no visible seams on the door face. Both lock and hinge rail edge of the door shall be continuously welded, full height of the door, with welds ground smooth. The top of the door shall be closed with a flush steel end closure treatment. The bottom of the door shall be closed with a recessed channel end closure. The interior core of the door shall be foamed in place, closed cell, polyurethane chemically bonded to the door face sheets. Doors shall have an R factor of not less than 11.1 and U factor of .09.
   3. Down size width of doors, as required, where full mortise continuous gear hinges are scheduled.
   4. Verify with Section 08 71 0, Door Hardware, the undercut requirements for exterior doors with thresholds. Standard undercut will not be acceptable for low profile handicap

thresholds.

C. Interior Flush Type Doors
   1. Door shall be Grade III, 1-3/4 inch extra heavy duty, 16 gauge, galvanized (according to ASTM A366 and ASTM A591 Class B), Model 1, full flush, seamless edge design.
   2. Door face sheets shall be formed from one sheet of metal with no visible seams on the door face. Both lock and hinge rail edge of the door shall be continuously welded, full height of the door, with welds ground smooth. The top and bottom of the door shall be closed with a recessed channel end closure. A kraft resin impregnated honeycomb or polystyrene slab core shall be permanently bonded to both door skins with thermal adhesive.

2.3 STEEL FRAMES

A. Flush frame construction of hot-dipped A60 Galvannealed steel conforming to ASTM A653 or hot dipped G90 galvanized steel with 2 inch face at jambs, heads, and mullions unless noted otherwise.
   1. Exterior frames: 14 gauge material masonry/flush.
   2. Interior frames and borrowed lights 16 gauge material drywall on frame wall, masonry on concrete or block wall.
   3. Assemble so that the face miter seam is “closed and tight”.
      a. Weld the face seam and the full web of the frame corner or intersection.
      b. Grind and dress smooth the weld area.
      c. Apply a zinc rich primer over the grinding area, and finish with a matching prime paint.
   4. Factory prepare for field installation of silencers
   5. Provide 7-gauge universal steel hinge reinforcement and prepare for 4½" x 4½" standard or heavy weight template hinges.
   6. Strikes reinforcing 16-gauge prepped for ANSI A115.1-2 strike.
   7. Strike jambs 14-gauge reinforcement

2.4 ACCESSORIES

A. Door Silencers: Except on weather-stripped frames, drill stops to receive three silencers on strike jambs of single frames and two silencers on heads of double frames.
B. Jamb Anchors:
   1. Provide a minimum of four anchors on both the hinge and latch jambs.
   2. Provide 14-gauge galvanized sheet steel, angle anchors welded for each jamb, which extends to the floor, punched for a minimum of two ¼" bolts.
C. Spreader: Provide frames with temporary steel spreader bars tack welded to jamb bottoms to maintain full rigidity and proper alignment during installation.
D. Astragals: Provide steel astragals (removable) as scheduled.
E. Glass Stops: Minimum 18 gauge stops with mitered corners shall be provided for light opening. Color to match door.
F. Louvers for Metal Doors: Louvers indicated for doors shall be steel stationary, 1/2 inch louver spacing, siteproof type with the size indicated on the Drawings. Furnish and install as part of the Work of this Section.
   1. Quality Standard: Titus, Division of Phillips Industries, Inc., Model T-700-FB. Finish shall be selected from manufacturer's interior grade "Enviro-Therm Coatings," color as selected by Architect.
   2. Screens: Where louvers are indicated on exterior doors, provide 18 x 14.011 inch alloy number 302/304 stainless steel wire cloth secured in removable .025 inch stainless steel

alloy number 302/304 roll formed frames. Mount screens on interior of doors with stainless steel screws.

G. Transoms: Where indicated, provide manufacturer's standard matching units.
H. Stops and Beads: Furnish 20 gauge metal glazing beads with the hollow metal frames at transoms, side lights, interior glazed panels, and other locations where beads are indicated in pressed steel frames. Glazing beads shall have mitered corners and are to be secured with stainless steel screws. Glazing beads for exterior frames shall be on the interior side of transoms and side lights. Glazing beads for interior frames shall be on the same side of door.
I. Exterior door frames shall be furnished with a Hager 430 Mortor Box or equal, supplier installed, as a junction box for door security monitoring contacts. Install junction box in frame head 12 inches from strike edge of frame to centerline of box. Weld junction box to inside of 15/16 inch frame rabbet.
J. Frames Set in Masonry: Provide 16 gauge galvanized metal "T" anchors corrugated or perforated not less than 2" wide by 10" long. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 inches apart.
K. Frames and doors shall be provided with boxes, cover plates and other necessary items to accommodate future electric strikes and required provisions for card readers at doors indicated on the door schedule.

2.5 PROTECTIVE COATINGS

A. Frames: Provide full immersion dip coat of rust-inhibitive metal primer reaching all surfaces in accordance with ANSI A250.10.
B. Doors: Fill in all groves and seams on top of door prior to painting, and provide full coverage electrostatic spray coat of rust-inhibitive metal primer.
C. Dry the protective coating of all frames and doors in a baking oven process.
D. Bituminous Coating: Coat the inside of frame profile with bituminous coating to a minimum thickness of 1/16".

2.6 FABRICATION

A. General design and construction
    1. Provide steel frames for doors, transoms, sidelight, borrowed light, and other openings to the size and design as shown on the architectural drawings.
    2. All finished work shall be strong and rigid, neat in appearance square, true, and free of defects.
    3. Provide jamb depths, trim, profile, and backbends as scheduled and shown on approved shop drawings.
    4. When shipping limitations so dictate, fabricate frames for large openings in sections designed for splicing or splining in the field by others.
    5. Mortised, reinforce, drill, and tap frames at the factory only for template mortised hardware, in accordance with approved hardware schedule and the hardware contractor template.
        a. Where surface mounted hardware is applied, frames to have reinforcing plates only; drilling and tapping by others.
B. Fire Rated: Provide fire rated assembly where scheduled or required by Code. All installations shall be in accordance with the requirements of NFPA 80.
C. Door Fabrication: Fully welded seamless construction. Metal tabs are un-accepted.
D. Door Reinforcement: Door bottom to have 16-gauge channel extending full width of door.
E. Frame Fabrication: Fully welded mitered corners ground smooth. Fully weld the interior

intersection of jambs. Integral stops minimum ⅝" depth and minimum 2½" width. Punch frames to receive silencers three on strike jamb of single leaf jambs. Provide 26-gauge sheet metal grout guards at hinges, lock, bolts, door closer, foot, and silencer locations.

F. Frame Reinforcement: Hinge reinforcing steel plate 3/16" thick x 1½" wide x 10" long and secured by a minimum of six spot-welds. Door closer foot is to be reinforcing 10-gauge steel plate, 14" long x stop width anchored by a minimum of 8 spot welds in the hinge corner of the head section of the jamb.
G. Hardware Location: Locate in accordance with "Recommended Locations for Builder's Hardware" published by National Builder's Hardware Association.
H. Labeled metal frames are required for labeled wood doors.

2.7 GROUTING OF EXTERIOR AND INTERIOR FRAMES

A. Paint inside (concealed) faces of door frames in exterior masonry or concrete walls, using fibered asphalt emulsion coating. Apply over shop primer approximately 1/8" thick and allow to dry before handling.
B. Fill jambs and heads of exterior hollow metal door and window frames and interior door and window frames set in masonry or concrete walls solid with grout.

PART 3 EXECUTION

3.1 INSTALLATION

A. Examine new and existing adjacent framing and rough opening preparation for conditions, which would prevent quality installation of doors and frames.
B. Install frames in accordance with SDI-105 and ASCE 7.
C. Install doors in accordance with ANSI/DHI A115-1G.
D. Install fire rated frames in accordance with NFPA 80.
E. Coordinate with masonry wall construction for anchor placement.
F. Install roll-formed-steel reinforcement channels between two abutting frames.
    1. Anchor to structure and floor.
G. Fully grout exterior and interior hollow metal frames, and hollow metal frames in masonry and concrete walls with non-shrink grout.
H. Install with no spaces between the frame and the structure to prevent water or pest from entering the building.
    1. Install sealant to maintain watertight seal.
I. Recess all door frames opening to the exterior of the building a minimum of one-inch from the exterior surface of the adjoining wall.
    1. Maintain the proper swing and opening capacity to meet the code requirements.

3.2 TOLERANCES

A. Maximum Diagonal Distortion: $^{1}/_{16}$" measured with straight edge, corner to corner.

3.3 ADJUSTING AND CLEANING

A. Adjust for smooth and balanced door movement.
B. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08 14 00
SOLID CORE WOOD DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Solid core wood doors and transom panels; flush and flush glazed configurations; fire rated and non-fire rated.

1.3 REFERENCES

A. ASTM E413 – Classification for Determination of Sound Transmission Class
B. ASTM E2074 – Standard Methods of Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
C. AWI – Quality Standards of the Architectural Woodwork Institute
D. HPMA HP – Hardwood and Decorative Plywood
E. NEMA (National Electric Manufacturers Association) LD3 – High Pressure Decorative Laminates
F. NFPA 80 – Fire Doors and Windows
G. NFPA 252 – Standard Method of Fire Tests for Door Assemblies
H. UL 10B – Fire Tests of Door Assemblies
I. Warnock Hersey – Certified Listings for Fire Doors
J. WDMA I.S. 1A
K. FBC – Florida Building Code

1.4 SUBMITTALS

A. Shop Drawings:
   1. Submit fully detailed shop drawings of all doors included in this section, including a complete door schedule of all wood doors.
   2. Schedule shall include door openings, elevations, sizes, types, swings, required undercuts, special beveling, and special blocking for hardware, factory machining criteria, factory finishing criteria, and identification of louvers, and glazing requirements.
B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
C. Samples:
   1. Submit sample of door veneer, 12” X 12” in size illustrating wood grain, stain color, and sheen.
   2. The approved sample shall become the standard of quality for all solid core wood doors delivered to the project site.

3. Contractor shall replace at no cost to the Owner, any door the Owner deems not conforming with the approve sample.
    a. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

1.5 QUALITY ASSURANCE

A. Manufacture all wood doors in accordance with AWI Quality Standard Section 1300 - Premium Grade Standards.
B. Finish doors in accordance with AWI Quality Standard Section 1500 – Premium Grade Standards.
C. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 5-years documented experience.
D. All fire rated wood doors shall comply with all the requirements of NFPA 80.
E. Fire Rated Wood Doors: Provide wood doors with fire resistance ratings indicated or required to comply with governing regulations and which are identical in materials and type of construction to those used in assemblies which have been tested in compliance with ASTM E152 and are labeled and listed by a testing and inspection agency acceptable to authority having jurisdiction.
F. Sustainably Harvested Wood: Certification Organizations shall be accredited by the Forest Stewardship Council.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Section 01 60 00 – Product Requirements.
B. Follow manufactures requirements for storage and handling of doors.
C. Deliver all wood doors to the site after the HVAC system is operational and temperature and humidity levels are controlled.
D. Doors shall be stored flat on a level surface in a dry conditioned shelter.
    1. Protect doors with resilient packaging.
    2. Do not store in damp or wet areas, or in areas that may be subject to sunlight that might blanch the veneer.
    3. Cover to keep clean, but allow air circulation by breaking factory seals once on site.
    4. Doors stored for more than 7-days shall have all ends primed.

1.7 PROJECT CONDITIONS

A. Section 01 31 00 – Project Management and Coordination.
B. Coordinate the work with door opening construction, doorframe, and door hardware installation.

1.8 WARRANTY

A. Section 01 77 00 - Contract Closeout.
B. Provide warranty for interior doors to include the life of installation.
C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials and telegraphing core construction.

PART 2 PRODUCTS

2.1 CONSTRUCTION

A. Wood Doors: Flush 1¾" thick meeting AWI Premium Grade standards to size per door schedule.
B. Face Veneer: Shall be plain-sliced, stain grade White Birch or equivalent as selected by the Architect, medium density, thoroughly kiln dried, smoothly sanded and laid at right angles to grain of cross-band.
C. Cross-bands: Kiln dried hardwood, 1/16" thickness, laid with grain at right angles to length of door.
D. Core: Stave core (SLC) or Structural Composite Lumber Core (SCLC).
E. Edge Bands: Kiln dried hardwood at all edges matching face veneer species, ¾" thick, glued to wood core.
F. Top and Bottom Rails: Kiln dried hardwood at all edges matching face veneer species, 1⅛" thick, glued to wood core.
G. Adhesives:
    1. Cross-band and face veneer adhesive shall conform to CS-35, Type I.
    2. Core and edge band adhesive shall conform to CS-35, Type II.
H. Finish: Stain color as selected by the Architect.

2.2 ACCESSORIES

A. Vision Lites:
    1. Provide vision lites of shapes and sizes where shown on drawings.
    2. Vision Panel and Hardware Clearance Dimensions
        a. Where interior nonrated and 20 minute wood doors are shown with lite cutouts which exceed the allowable height, width, or percent of area of door, or lock-to cutout dimension is less than manufacturer allows for lifetime warranty, provide stave core door construction which allows a minimum of 6 inch top rail, 6 inch stiles, 8 inch bottom rail, and a minimum 1-1/2 inch lite to lock clearance equal to Weyerhaeuser, Eggers, and Algoma's FGFW full glass door with lifetime warranty. FM where required.
    3. Door Accessories: Manufacture and supply lites as a unit and meet the requirements of Section 08 80 00.
B. Wood Stops:
    1. Door supplier shall provide wood stops (similar to Weyerhaeuser W-6 and Algoma Flush Bead W-9) for nonrated and 20 minute doors. Stop to be flush with face veneer; recessed stops not acceptable.
C. Astragal:
    1. Pairs of nonrated wood doors with 3 point latching, lockset and flush bolts shall be supplied with steel edges and steel astragal, factory applied and factory prepared for hardware as scheduled. Astragal shall be mounted on key side of doors. Where active leaf is RH (right hand) or LH (left hand), the astragal shall be mounted on the inactive leaf and overlap the active leaf. Where the active leaf is RHR (right hand reverse) or LHR (left hand reverse), the astragal shall be mounted on the active leaf and overlap the inactive leaf.

D. Fire Rated Louvers:
   1. Fire Rated Fusible Link Door Louvers: Provide FLDL-UL (size as shown on Door Schedule) fusible link louvers as manufactured by Anemostat Door Products, 1220 Watson Center Rd., Carson, California 90745, (213) 775-7441. Louver blades and frame shall be fabricated from 16 gauge cold rolled steel with stainless steel operating spring closing assembly. Frame shall have tight mitered corners and countersunk mounting holes. Louver shall be attached to door with #8 x 32 Phillips head steel through bolts with a blank head on one side for a flush appearance. Free air flow shall be a minimum of 40 percent free area. Finish to be baked enamel and shall be as selected by Architect from manufacturer's standard colors.

E. Louvers:
   1. Door Louvers: Provide CHDL-2F louvers as manufactured by Anemostat Door Products, 1220 Watson Center Road, Carson, California 90745, (213) 775-7441. Louver blades and frame shall be fabricated from 18 gauge frame and 20 gauge louver blades of cold rolled steel. Frame shall have tight mitered corners and countersunk mounting holes. Louver shall be attached to door with #8 by 3/4 inch wood screws. Free air flow shall be a minimum of 60 percent free area. Finish to be baked enamel and shall be as selected by Architect from manufacturer's standard colors.

F. Wood Transom Panels
   1. Transom panel veneer shall be continuous matched with wood door.
   2. Wood door and transom supplier shall furnish Stanley #1697 spring bolts for concealed attachment of transom panel.

G. Fire-Rated Solid Core Doors
   1. Provide faces and grade to match nonrated doors as specified in Article 2.1B.
   2. Core Construction: Manufacturer's standard core construction as required to provide fire resistance rating indicated.
   3. Stile Construction: Manufacturer shall provide stiles that will provide the maximum screw withdrawal rate for use with full mortise hinges. Withdrawal rate shall be not less than 40 lbs. Stiles shall be manufacturer's standard, SLM (special laminated material) or uperstile. Stiles constructed with Maranite Interstile are not acceptable. Test results for screw withdrawal shall be submitted to the Architect.
   4. Door Thickness: 1-3/4 inch.
   5. Edges:
      a. Top and Bottom - Mill option hardwood.
      b. Vertical - Same species as face veneer.
   6. Lock Blocks: Manufacturer shall provide lock blocks for mortise and bored locks, minimum 5 inches by 10 inches, or manufacturer's standard, 2 lock blocks for RIM, mortise and vertical rod exit devices. Provide 5 inch top rail for attachment of closers and bottom rail (heights as required) for attachment of vertical rod exit device bottom latch and automatic flush bolts.
   7. Pairs of wood doors with a 20, 30, 45, 60, and 90 min. rating with 3 point latching, lockset and flush bolts, shall be supplied with manufacturer's standard steel edges and steel astragal, factory applied and factory prepared for hardware as scheduled. Astragal shall be mounted on key side of doors. Where active leaf is RH (right hand) or LH (left hand), the astragal shall be mounted on the inactive leaf and overlap the active leaf. Where the active leaf is RHR (right hand reverse) or LHR (left hand reverse), the astragal shall be mounted on the active leaf and overlap the inactive leaf. For special beveling requirements for pairs of doors, see Article 2.03 A.
   8. Where pairs of labeled doors are used in a means of egress with 2 vertical rod exit devices, the doors shall be provided with manufacturer's standard edges metal as tested without the

steel astragal.

9. For labeled wood doors to receive glass, door supplier shall provide manufacturer's standard frame formed of 18 gauge cold-rolled steel, factory primed, and approved for use in door of fire rating indicated.

H. Sound Doors
   1. Provide faces and grade to match nonrated doors as specified in Article 2.1B.
   2. Furnish doors with an STC rating of 40. If manufacturer will not provide a STC 40 due to glass areas, door size, etc., furnish STC 40 constructed doors.
   3. Core Construction: Manufacturer's standard acoustical damping material.
   4. Door Thickness: (1-3/4 inch) (2-1/4 inch).
   5. Double glazed with 1/4 inch laminated glass by Section 08 80 00.
   6. Drop seals and sound gasketing by door manufacturer.
   7. Edges:
      a. Top and Bottom - Mill option hardwood.
      b. Vertical - Provide veneer wrapped edges over mill option hardwood stiles.
      c. Vertical - Same species as face veneer.

I. All door assemblies to have no added urea-formaldehyde in wood components and adhesives.

PART 3 EXECUTION

3.1 FABRICATION

A. Refer to Door Schedule for types, sizes, and details.
B. Fabricate non-rated doors in accordance with AWI Quality Premium requirements.
C. Fabricate fire rated doors in accordance with AWI Quality Premium and to UL requirements.
   1. Attach fire-rating label to door.
D. Astragals for Fire Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge specifically for double doors.
E. Sound Rating for Single Door Leaf and Frame Assembly: Provide a minimum STC 30, see door schedule for required rating meet ASTM E413.
F. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
G. Vertical Exposed Edge of Stiles: Provide hardwood for transparent finish.
H. Provide factory-machined doors for finish hardware per hardware requirements and dimensions.
   1. Do not machine for surface hardware.
   2. Provide solid blocking for through bolted hardware.
I. Factory fit doors for frame opening dimensions identified on shop drawings.

3.2 INSTALLATION

A. Cut all doors for specified hardware and hang.
   1. Protect as recommended by manufacturer.
   2. Fit all doors to provide a clearance of $^{1}/_{16}$" to ⅛" at jambs and heads.
   3. Bevel lock stile ⅛" to 2"
   4. Ease all edges of doors.
   5. Maximum clearance at floor shall be ½", unless otherwise indicated.
   6. Install wall mounted doorstops in alignment with the door handle.
      a. Provide proper backing behind the drywall for the doorstop to prevent the door from puncturing the drywall.
      b. Coordinate with Section 09 22 16.

3.3 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Temporary ventilation: Provide temporary ventilation as follows:
      a. During and immediately after installation of prefabricated wood products, and laminated wood products at interior spaces, provide temporary ventilation.

END OF SECTION

SECTION 08 41 13
ALUMINUM DOORS/STOREFRONT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Divisions 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Aluminum storefront systems.
   2. Hardware for aluminum doors will be furnished under Specification Section – Door Hardware, except continuous gear hinges, but installed under this Section.

1.1 REFERENCES

A. AA (Aluminum Association) – Designation System for Aluminum Finishes
B. AAMA Series number 11 – Design Wind Loads for Buildings and Boundary Layer Wind Tunnel Testing
C. AAMA 101 – Standard Specification for Window, Doors, and Skylights
D. AAMA 200 – Standard Practice for the Installation of Windows with Frontal Flanges for Surface Barrier Masonry Construction
E. AAMA 502-08 – Voluntary Specification for field Testing of Newly Installed Fenestration Products
F. AAMA 511 – Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products
G. AAMA 606.1 – Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum
H. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
I. AAMA 608.1 – Voluntary Guide Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum
J. AAMA 701/702 – Combined Voluntary Specifications for Pile Weather-stripping and Replaceable Fenestration Weatherseals
K. AAMA 1503.1 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
L. ASCE 7 – Minimum Design Loads for Buildings and other Structures
M. ASTM A123/A123M – Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
N. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
O. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
P. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material

Q. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications
R. ASTM D2287 – Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
S. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
T. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
U. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
V. ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
W. ASTM F588 – Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact
X. FED L-S-125B – Screening, Insect, Nonmetallic
Y. FED RR-W-365A – Wire Fabric (Insect Screening)
Z. FBC – Florida Building Code
AA. Current Florida Building Code Product Approval

1.3 SUBMITTALS

A. Product Data: For each product specified include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide structural test reports that meet all hurricane and impact resistant codes and requirements.
B. Shop drawings shall show elevations of each door type, door construction details and methods of assembling sections, hardware locations and installation methods, dimensions, and shapes of materials, anchorage and fastening methods, weatherstripping, and finish requirements.
    1. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings and Schedules.

1.4 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide aluminum curtain wall systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with South Florida Building Code Test Protocols TAS 201, TAS 202 and TAS 203.
    1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² (1.10 m³/h·m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 psf (299 Pa).
B. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E 331 at test pressure differential of: 12 PSF (575 Pa) (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing.
C. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane as indicated on the drawings.
D. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AAMA Specifications for Aluminum Structures.
    1. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.

2. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).

E. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.

F. Test Procures and Performance
1. Air Infiltration
   a. Test Unit in accordance with ASTM E283 at a static air pressure difference of 6.24 psf.
   b. Air infiltration shall not exceed 0.02 CFM per SF of fixed wall area.
2. Water Resistance Test
   a. Test unit in accordance with ASTM E331.
   b. There shall be no uncontrolled water leakage at a static test pressure of 11.25 psf.
3. Uniform Load Deflection
   a. Test in accordance with ASTM E330.
   b. Refer to Structural drawings for design wind pressures, positive and negative normal to the plane of the wall.
   c. Deflection under design load shall not exceed L/175 of the clear span.
4. Uniform Load Structural Test
   a. Test in accordance with ASTM 330 at a pressure 1.5 times the design wind pressure.
   b. At the conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.
5. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane as indicated.
6. Manufacturer shall certify that storefront system has been tested and conforms to SSTD and ASTME Miami-Dade County, PA 201, 202, and 203.

1.5 QUALITY ASSURANCE

A. Doors shall be provided to conform with the Florida Building Code. These requirements supersede Technical Specifications in this Section.
B. Provide test reports from AAMA Accredited Laboratories.
C. System shall conform to large and small impact requirements.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products are based on YKK. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.
1. Tubelite Division of Indal, Inc., Reed City, Michigan

2. Wausau Metals Corp., Wausau, Wisconsin
3. EFCO Corp., Monett, Missouri

2.2 TYPE

A. Basis of design is YHS 50 FS.
B. Frame: Extruded 5" deep and 2½" sightline.
C. Door Stile Design: Wide stile, vertical stiles 5 inches, top rail 6-1/2 inches, and bottom rail 10 inches.

2.3 MATERIALS AND CONSTRUCTION

A. Sections shall be extruded from 6063-T5 aluminum alloy (A.S.T.M. B221 Alloy GS 10A T5).
B. Major portions of the door stiles shall be .125 inch in thickness, and glazing molding shall be .050 inch thick.
   1. Mullions shall be as detailed on Drawings and as required for type of door being furnished.
C. Screws, miscellaneous fastening devices, and internal components shall be of stainless steel, plated, or corrosion-resistant materials of sufficient strength to perform the functions for which they are used.
D. Wide Stile: Vertical stiles shall be 5 inches, top rail 6-1/2 inches, and bottom rail 10 inches. (Note: Coordinate w/door types.) Corner construction shall consist of both sigma deep penetration and sigma fillet welds and mechanical fastening. Inside joints between the top rail and vertical stiles shall have a continuous bead of sealant. Interior glazing stops shall be square snap-in type with neoprene bulb type glazing. Square stops on exterior side shall be lock-in tamperproof type. No exposed screws shall be required to secure stops.
E. Door shall be weatherstripped on 3 sides with metal backed pile cloth installed in the door and/or frame. An adjustable weatherstrip astragal with stainless steel backing shall be provided at the meeting stiles of a pair of doors.
   1. Provide compression weatherstripping at fixed stops. At other locations, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
F. Doors shall have a portion of the top rail closed for mounting security door contacts.
G. Where aluminum doors are scheduled to receive a concealed overhead stop, the jamb bracket shall be mortised into the frame and the channel mortised into the top of the door. The cut for the arm on the stop side of the door shall not be cut below the stop strip of the frame.
H. All dissimilar metals must be properly insulated to prevent galvanic action.
I. All exposed fasteners shall be aluminum or stainless steel.
J. All aluminum extrusions shall have a minimum wall thickness of .080” and comply with ASTM B221 (ASTM B221M), 6063-T5 Aluminum Alloy.
K. All units to be “dry-glazed” with EPDM gasket on both exterior and interior to accept impact rated doubt glazed insulating glass.

2.4 HARDWARE

A. Aluminum doors shall receive heavy duty full mortise continuous gear hinges as manufactured by Roton Division Hager Hinge, Villa Park, Illinois. Furnish 780-112HD or 780-111HD as required by frame manufacturer for flush or inset door mounting.
B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.
   1. Stanley Hardware, New Britain, Connecticut
   2. Select Products Limited, Kalamazoo, Michigan
   3. Markar Products, Inc., Lancaster, New York
C. Continuous gear hinge finish shall match door and frame finish.
D. For balance of hardware furnished by others, refer to Section 08 71 00 - Door Hardware.
E. Weatherstripping: Products shall be as manufactured by Pimco or approved equal.
   1. Threshold: Model #1042.
   2. Door shoe: Model # 209A
   3. Door bottom sweep: Model #345AV.
   4. Door top: Model #347A with #68AR.
   5. Astragal: Model # H355.
F. Frames and doors shall be provided with boxes, cover plates and other necessary items to accommodate future electric strikes and required provisions for card readers at doors indicated on the door schedule.

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to shop drawings.
B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
C. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory-assemble door units and factory install hardware to greatest extent possible. Reinforce door units as required for installing hardware indicated. Cut, drill, and tap for factory installed hardware before finishing components.
   1. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single door frames and 2 silencers on head of double door frame.
D. Storefront frames: unless otherwise noted on drawings;
   1. Depth of frame 5” or as required for applicable wind loading.
   2. Face dimension shall not be less than 2”
   3. Frame components shall be shear block construction.

2.6 FINISH

A. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.
B. Both interior and exterior aluminum sections shall have the following finish:
   1. Dark bronze anodized - AA-M-10C-22A-44 (AAMA 606.1).

PART 3 EXECUTION

3.1 PREPARATION

A. Openings for aluminum entrances and storefronts shall be prepared to the proper size, plumb, square, level, and in the proper location and alignment as shown on the Architect's Drawings and the final shop drawings.

3.2 INSTALLATION

A. Aluminum doors shall be securely installed according to the manufacturer's recommendations, and operating hardware shall be checked for proper function and adjustment.
B. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer’s written instructions.
   1. Install surface mounted hardware according to manufacturer’s written instructions using concealed fasteners to greatest extent possible.
C. Install glazing to comply with requirements of Section – Glazing, unless otherwise indicated.
D. Do not cut aluminum frame stop strip when mounting exit devices and closers.
E. Provide conduits at frames and card reader locations to accommodate the future installation of card readers at doors indicated on the finish schedule. Conduits shall be run to 6” above the finished ceiling height and accessible to ceiling space.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weatherstripping, smooth operation, and weathertight closure.

3.4 PROTECTION

A. Protect the aluminum doors and their finish against damage from construction activities and harmful substances. Clean the aluminum surfaces as recommended for the type of finish applied.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES:

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Hardware for wood and hollow steel doors
   2. Lock Cylinders for gates, folding partitions, wire cages, and doors
   3. Thresholds
   4. Gaskets

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
B. NFPA 80 - Fire Doors and Windows
C. AWI - Architectural Woodwork Institute
D. BHMA - Builders' Hardware Manufacturers Association
E. DHI - Door and Hardware Institute
F. Florida Accessibility Code for Building Construction, FBC
G. NAAMM - National Association of Architectural Metal Manufacturers
H. NFPA 101 - Life Safety Code
I. SDI - Steel Door Institute
J. FBC - Florida Building Code

1.4 COORDINATION

A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

1.5 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in manufacturing door hardware with minimum 5-years experience.
B. Hardware Supplier: Company specializing in supplying institutional door hardware with minimum 5-years documented experience.
C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this Section and be readily available for consultation.

1.6 REGULATORY REQUIREMENTS

A. Conform to the FBC for requirements applicable to both fire rated doors/frames and accessibility for the physically disabled.
B. Conform to the applicable sections of NFPA 101.

1.7 CERTIFICATIONS

A. Architectural Hardware Consultant shall inspect complete installation and certify that hardware and installation is in accordance with manufacturer's instructions and this specification.
B. Provide two copies of certifications to the Architect.

1.8 SUBMITTALS

A. Submit schedule and product data under provisions of Section 01 33 00.
B. Indicate locations and mounting heights of each type of hardware.
C. Provide product data on specified hardware.
D. Submit samples under provisions of Section 01 33 00.
E. Submit samples of hinge, latch set, exit device, door closer, threshold, illustrating style, color, and finish.
F. Samples: Incorporate the samples with in the Work.
G. Submit manufacturer's parts lists, templates, and installation instructions under provisions of Section 01 33 00.
H. Submit manufacturer's certificate under provisions of Section 01 40 00 that fire rated hardware meets or exceeds specified requirements.

1.9 FIRE-RATED OPENINGS:

A. Provide hardware for fire-rated openings in compliance with ANSI, NFPA Pamphlet No. 80, NFPA Standards No. 101, FBC and UL10C. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
B. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating “Fire Exit Hardware”.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 77 00.
B. Include data on operating hardware, and inspection procedures related to preventative maintenance.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 60 00.
B. Store and protect products under provisions of Section 01 60 00.
C. Package hardware items individually; label and identify package with door opening code and hardware group to match hardware schedule.

D. Deliver all final keys and construction key voiding devices to Owner's Lock Department by security shipment direct from hardware supplier.
   1. Delivery Address:
      The School District of Indian River County
      Department of Maintenance & Plant Operations
      Vero Beach, Florida 32967
E. Deliver two copies of factory key biting schedule to the Owner's Lock Department in conjunction with delivery of final keys.
F. Protect hardware from theft by cataloging and storing in secure area.

1.12 WARRANTY

A. Provide a minimum of a 5-year warranty period under provisions of Section 01 77 00.
B. Warranty: Include coverage of door closers, locksets, latch sets, exit devices hinges and all items listed in the hardware schedule

1.13 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to different or special hardware component.
B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Hinges: Hager, Stanley
B. Reinforcing Pivots: Hager
C. Cylinder Locks: Schlage IC Core
D. Latch Sets: Corbin Russwin
E. Cabinet Locks: Corbin Russwin
F. Cylinder: Corbin Russwin
G. Mortise Locks: Corbin Russwin
H. Exit Devices: Von Duprin, Monarch
I. Removable Mullions: Von Duprin, Monarch as required - Removable using IC Core
J. Manual Automatic Bolts: Ives, Glynn-Johnson, DCI
K. Coordinators: Monarch, Ives, DCI
L. Push/Pulls: Quality, Rockwood, Baldwin
M. Protection Plates: Quality, Rockwood, Baldwin
N. Gaskets: Pemko, National Guard, Reese
O. Power Supplies: Von Duprin
P. Power Transfer: Von Duprin

2.2 HINGES

A. Size: Provide 4½" wide x 4½" high, FBB1191 at exterior and FBB1291 at interior locations.
B. No less than three hinges on any door and add a reinforcing pivot on all doors over 3' 0" wide.
C. Ball Bearing hinges on doors with door closers and provide Non-Removable Pin type on all exterior out-swing doors.

2.3 LOCKSETS

A. Supply in the following functions:

LOCATION	FUNCTION
1. Passage	10S
2. Privacy	40S(44S in Grades K-2)
3. Offices / Classrooms	D94RD x RHD x 626
4. Storeroom/Mechanical Room	D94RD x RHD x 626
5. Deadlocks (student areas)	B663R
6. Deadlocks (non-student areas)	B660R
7. Driveway Gates	Knox Padlock 3753

B. Electronic Lever Lock: Schlage L9080REU x 06 x 630 or D80RDEU X RHO X 626

2.4 DOOR CLOSERS

A. All door closers shall be a 4040/4041 series.
B. Furnish Parallel arms on all doors scheduled for closers except where they are mounted showing in corridors.
C. Supply nylon spacer for fifth mounting screw on parallel arm installations where required due to frame configuration.
D. Supply with EDA arm on installations in main corridor entrances, gymnasiums, locker rooms, and restrooms.

2.5 EXIT DEVICES AND POWER SUPPLY

A. Supply in the following functions:

	LOCATION	FUNCTION
2.	Non-fire rated	19R NLP, 19R DT or 19R BE with 560-strike as required
3.	Fire-rated	F19R SE or F19R BE with 570-strike as required
4.	Non-fire rated (pairs)	19R NLP, 19R DT or 19R BE with 560-strike and 4023 mullion as required.
5.	Fire-rated (pairs)	F19R SE or F19R BE with 570 strike and F4023 mullion as required.
6.	Fire-rated (Electronic)	ELLX98L-F X 992L X 06 X 26D
7.	Non-fire-rated (Electronic)	SD ELL X 98NL X 990NL X 26D
8.	Power Supply	PS873B X 4TD
9.	Electrical Power Transfer	EPT-10 X SP28

* Note - Removable Mullions shall be key removable with IC cylinders.

2.6 DOOR TRIM

A. All push plates, pull plates and kick plates manufactured of .050 stainless steel.
B. Push plates and pull plates 4" wide x 16" high.
C. Kick plates shall be 10" high x 2" less than door width.

2.7 DOOR STOPS

A. Door stops of the follow types, as determined by the hardware schedule:
   1. If wall mounted, Contractor shall supply and install proper blocking in the wall to prevent failure of the drywall.

2.

MANUFACTURER	MODEL	WHERE DOORS INTERFERE WITH ANOTHER
Ives	443 or 436 as required	470 or 471 as required
Rockwood	475 or 441 as required	455 or 456 as required
Baldwin	4001 or 4086 as required	4130 or 4140 as required

2.8 AUTOMATIC FLUSH BOLTS, SURFACE BOLTS AND COORDINATORS

A. Supply door bolts of the following type:

1.

MANUFACTURER	NON-FIRE RATED	FIRE RATED
H. B. Ives	454-F26D 8"	456-B26D, 459-B26D as required.
Glynn-Johnson	1631 or 1632	FB8 or FB7
DCI	1008-US26D	842-US26D

B. Supply coordinators of the following type:

1.

MANUFACTURER	MODEL
Monarch	B-1277 with B-1278-opening bar
H. B. Ives	469-B26D with 478-carry bar
DCI	500 with carry bar

2.9 THRESHOLDS AND SEALS

A. Supply thresholds and seals of the following types:

1.

MANUFACTURER	THRESHOLD	WEATHER STRIP	ASTRAGAL
Pemko	2005 AT	303-BS	355-CS
National Guard Products	896 V	135 NA	146 V
Reese Enterprises, Inc	S483 AV	815 A	275 A

2.10 OVERHEAD RAIN DRIP

A. Provide overhead rain drip of the following types at all exterior door frame locations or as scheduled within these specifications:

1.

MANUFACTURER	MODEL
Pemko	346PW

2.11 FASTENINGS

A. All screws of matching finish to their product and to manufacturer's standards for that item and its intended use.
B. All surface mounted hardware, use manufacturer's supplied bolts for through bolting of hardware.

2.12 KEYING

A. Pre-Order Meeting: Hardware Supplier shall meet with a representative of the Owner's Lock Department and Department Head to establish a keying schedule before placing any orders.

B. Locks:
   1. Provide keying as established in pre-order meeting with Hardware Supplier.
   2. All locks to be Construction Master Keyed using the split key method.
C. All locks factory keyed to the School District's restricted keyway.
D. Hardware Supplier and a representative of the Owner's Lock Department will meet and establish final count of locks and cylinders.
   1. The Owner's Lock Department will transmit a letter to the Lock Company releasing locks and cylinders in the amount established in the final count to the Hardware Supplier.
E. Supply two keys for each lock with a maximum of four keys of keyed alike sets.
F. Supply keys in the following quantities:
   1. Five Master Keys
   2. Five Grand Master Keys
   3. Five Great Grand Master Keys
G. Key Delivery: Refer to Section 08 71 00.
H. Visual Key control: Use visual key control – stamp keys only. Stamp all keys "Do Not Duplicate".

2.13 KEY CABINETS

A. Key Cabinet: Sheet steel construction, piano hinged door with pin tumbler lock of brass construction.
B. Cabinet Size: Provide a size for known project keys plus 10%.
C. Horizontal metal strips for key hook labeling with clear plastic strip cover over labels.
D. Finish shall be baked enamel finish, gray color.

2.14 KNOX BOX

A. Provide the required Knox box as manufactured by Knox Company to meet the local Fire Department criteria.
   1. Coordinate ordering and locating with the Fire Department having jurisdiction.
B. Provide a Knox box as manufactured by Knox Company to meet the School District's Police Department criteria.
   1. Coordinate ordering and locating with the School District's Police Department
C. Provide two Knox padlocks to meet the local Fire Department criteria.
   1. Coordinate ordering and locating with the Fire Department having jurisdiction.

2.15 FINISHES

A. Exterior Hinges: US32D
B. Interior Hinges: US26D
C. Exterior Locks: US32D
D. Interior Locks: US26D
E. Coordinators: US26D
F. Push, Pull & Kick Plates: US32D
G. Door Closers: AL
H. Exit Devices: US32D
I. Door Stops & Holders: US32D
J. Thresholds & Weather-strip: AL

2.16 CLOSER / MAGNETIC HOLD OPEN SYSTEM:

A. Furnish closer/electromagnet complete with required accessories necessary for a complete working system. Supply a 2-year warranty.
   1. MANUFACTURER SERIES
      LCN 4041
      RIXSON 998

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
B. Beginning of installation means acceptance of existing conditions.
C. Do not install any hardware until after the hardware manufacturer's representative pre-installation class.
   1. Class is to insure proper installation of the specified products.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
B. Use the templates provided by hardware item manufacturer.
C. Mounting heights for hardware from finished floor to center line of hardware item:
   1. Locksets: 38 inches
   2. Push/Pulls: 42 inches
   3. Dead Locks: 48 inches
   4. Exit Devices: 38 inches
D. Conform to Florida Accessibility Code for Building Construction for positioning requirements for the disabled.
E. Set all thresholds in a full bed of butyl rubber.

3.3 ADJUST AND CLEAN

A. Adjust and check the operation of each item of hardware and each door, to ensure the proper function of every item.
   1. Adjust or replace all items that to operate freely and smoothly.
B. Made final adjustments after all ventilating systems are in operation.
C. Clean all hardware and adjacent surfaces after hardware installation.
D. Instruct Owner's personnel in adjustment and maintenance of hardware and hardware finishes.

3.4 HARDWARE SCHEDULE:

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.

Hardware Group No. 1 - Exterior

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr	
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
2	EA	POWER TRANSFER	EPT10		689	VON
2	EA	ELEC PANIC HARDWARE	RX-EL-HH-9927-NL-OP-110MD299F-SNB		626	VON
2	EA	I.C.CYLINDER	C607		626	BES
2	EA	RIM CYLINDER	20-057-ICX		626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA		689	LCN
1	EA	POWER SUPPLY	PS914 900-2RS			VON

Hurricane code compliant opening.
Balance of hardware by storefront manufacturer.

Operational Description
,
Free Egress at all times. Pressing Push Bar retracts latchbolts
Surface Mount, Non Handed, Universal, Mechanical Closer , Mount as Required, Spring Cush-n-Stop Arm, Standard Cover, Self Reaming & Tapping Screws

Hardware Group No. 2 - Reception

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr	
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	PANIC HARDWARE	9827-EO		626	VON
1	EA	ELEC PANIC HARDWARE	RX-EL-9827-L-06		626	VON
1	EA	I.C.CYLINDER	C607		626	BES
1	EA	RIM CYLINDER	20-057-ICX		626	SCH
2	EA	SURFACE CLOSER	4040XP EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
2	EA	SILENCER	SR64		GRY	IVE
1	EA	POWER SUPPLY	PS914 900-2RS			VON

Operational Description
,
Free Egress at all times. Pressing Push Bar retracts latchbolts
Self-Closing

Hardware Group No. 3 – Exist. Corridor

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr	
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	FIRE EXIT HARDWARE	9827-EO-F		626	VON
1	EA	FIRE EXIT HARDWARE	9827-L-F-06		626	VON
1	EA	I.C.CYLINDER	C607		626	BES
1	EA	RIM CYLINDER	20-057-ICX		626	SCH
2	EA	SURFACE CLOSER	4040XP EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK 20FT PSA		BK	ZER

Operational Description
Free Egress at all times. Pressing Push Bar retracts latchbolts
Free Egress at all times. Pressing Push Bar retracts latchbolts
Self-Closing

Hardware Group No. 4 - Restroom

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr	
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	PRIVACY LOCK	L9040 06L		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Operational Description
Privacy Lock Mortise
Self-Closing

Hardware Group No. 5 - SRO Office

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050J 06L		626	SCH
1	EA	I.C.CYLINDER	C607		626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Operational Description
Latchbolt retracted by knob/lever from either side unless outside is made inoperative by key Outside or by turning inside thumbturn. When outside is locked, latchbolt is retracted by key outside or by knob/lever inside. Outside knob/lever remains locked u
Self-Closing

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. All glass and glazing work as indicated on the drawings and specified herein.

1.3 REFERENCES

A. ASCE-7 – Minimum Design Loads for Buildings and other Structures
B. ANSI Z97.1 – Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test
C. ASTM C-162 – Standard Terminology of Glass and Glass Products
D. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
E. ASTM C920 – Standard Specification for Elastomeric Joint Sealants
F. ASTM C1036 – Standard Specification for Flat Glass
G. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
H. ASTM C1172 – Standard Specification for Laminated Architectural Safety Glass
I. ASTM C1349 – Standard Specification for Architectural Flat Glass Clad Polycarbonate
J. ASTM C 1503 – Standard Specification for Silvered Flat Glass Mirror.
K. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
L. ASTM E152 – Methods for Fire Test of Door Assemblies
M. ASTM E283 – Standard Test Method For Determining Rate of Air leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
N. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
O. ASTM E1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
P. ASTM E2025 – Standard Test Method for Evaluating Fenestration Components and Assemblies for Resistance to Impact Energies
Q. CPSC 16 CFR 1201 Safety Standards for Architectural Glazing Materials
R. FBC – Florida Building Code
S. GANA – Glazing Manual
T. GANA Laminated Glazing Reference Manual
U. FGMA – Sealant Manual
V. NFPA 80 – Standard for Fire Doors and Fire Windows
W. NFPA 252 – Standard Methods of Fire Test of Doors Assemblies

X. NFPA 257 – Standards on Fire Test of Window and Glass Block Assemblies

1.4 LABELS

A. Glass shall bear labels indicating the manufacturer, type and thickness, and a note "Do Not Remove Label".
B. All safety glass shall at least a permanent label indicating manufacturer, type, thickness, and compliance with CPSC 16 CFR 1201.
C. If temporary label, label is to remain on glass until District Building Inspection is complete, then removed and turned into the District Building Department.

1.5 GLASS BREAKAGE

A. The glazing subcontractor shall be responsible for all glass broken, scratched, damaged, or defective and shall replace same at his expense.

1.6 SUBMITTALS

A. Manufacturer's Data:
   1. Submit two-copies of manufacturer's specifications, and installation instruction for each type of glass, glazing sealant and compound, gasket and associated miscellaneous material required.
   2. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.
   3. Show by transmittal that the Glazer distributed one copy of each recommendation and instruction.
   4. If Safety glass, provide two copies of manufacturer certification of the glass meeting the requirements of CPSC 16 CFR 1201.
B. Samples: Submit two-samples 12" x 12" in size illustrating glass coloration.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, SIGMA and Laminators Safety Glass Association - Standards Manual for glazing installation methods.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5-years documented experience.

1.8 WARRANTY

A. Provide a 5-year warranty to include coverage for sealed glass units from seal failure.
B. Provide a 5-year warranty to include coverage for delamination of laminated glass and replacement.

1.9 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading, without failure including loss or glass breakage attributable to the following: defective manufacturer, fabrication, and

installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Hurricane rated impact loading on exterior glazing.

C. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

D. Glass Design: Glass thicknesses as indicated are for detailing only. Confirm glass thicknesses by analyzing Project loads and in service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed of heat-treated) to meet or exceed the following criteria:
   1. Glass Thicknesses: Minimum glass thickness, nominally, of lites in exterior walls is 6.0 mm.
   2. Glass Thicknesses (Hurricane): Select minimum glass thicknesses to comply with ASTM E-1300, according to the following requirements and performance standards:
      a. Specified Design Wind Loads: Based on location or as noted in documents.
      b. Safety
         i) CPSC Cat. I and II
      c. Security
         i) UL972
         ii) Blast Resistance
      d. Natural Disasters
         i) Hurricane Small Missile (River Gravel #6 for impact)
         ii) Hurricane Large Missile (2" x 4" timer weighing 9 lbs.)

E. Specific hazardous locations: The following shall be considered specific hazardous locations for purposes of glazing.
   1. Glazing in ingress and means of egress doors.
   2. Glazing adjacent to a door and within the same wall plane as the door whose nearest vertical edge is within 24 inches of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface, unless an intervening interior permanent wall is between the door and the glazing.
   3. Glazing in fixed panels having a glazed area in excess of 9 square feet with the lowest edge less than 18 inches above the finish floor level or walking surface within 36 inches of such glazing, unless a horizontal member not less than 1-1/2 inches in width is located between 24 inches and 36 inches above the walking surface.

F. Normal thermal movement results form the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

PART 2 PRODUCTS

2.1 GENERAL

A. Tempered Glass: Glass to be heat-strengthened by Manufacturer's standard process (after cutting to final size), to achieve a flexural strength of four times normal glass strength; provide

tempered glass where required by code, generally 4’ horizontally from doors and within 18" of floor to comply with Federal Specification DD-6-1403, or as scheduled.

2.2 GLASS TYPES

A. Interior Window Glazing: Hollow Metal frames
   1. Tempered Glass: ASTM C1048, Kind FT fully tempered, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1.
   2. Wired Glass:
      a. Can be used only in fire rated assemblies,
      b. Shall meet the safety glazing requirements of CPSC 16 CFR 1201,and
      c. Have the proper fire rating for the assembly (see plans for assembly fire ratings).
         i) SAFTI – Superlite 1-W acceptable for Cat II location per CPSC
         ii) Pilkington – Pyroshield Plus acceptable for Cat I location per CPSC
         iii) Cat I location is glass area less than or equal to 9 SF, and Cat II is glass area greater than 9 SF.
      d. All glass shall have label indicating fire rating and safety glazing rating.
B. Exterior Window Glazing: Aluminum Frames
   1. Impact rated as required by FBC Product Approval System with colored tint as selected by the Architect with a minimum SHGC of 0.44 and U-Value of 0.86 at building exterior.
C. Exterior Door Glazing: Hollow Metal Doors and Frames
   1. Impact rated as required by FBC Product Approval System.
D. Miscellaneous Glazing in Interior Doors:
   1. ¼" clear, tempered glass.
   2. Safety rated and fire rated glass where label door is required by schedule or code.
E. One-way Reflective Glass: Laminated from 2 pieces of Type I, Class 1, Quality q3, laminated together with a clear 0.030" thick polyvinyl butyl interlayer, total ⅜" thick, coated on the No. 2 face with a hard, adherent film of chromium or other approved coating of equal durability.
   1. Glass shall transmit not more than 14% of total incident visible light and shall reflect from the front surface of the coating not less than 33% of the total incident visible light.
F. Glazing in Millwork: ¼" clear, tempered glass.
G. Provide and install glass mirrors as indicated on plans, minimum thickness of ¼" tempered or laminated safety glass and labeled as such.
H. Mirror Glass
   1. Safety Glass Mirrors
      a. Tapeback: Provide annealed float glass mirrors with manufacturer applied safety tape applied to the back surface and complying with FS DD-G-1403, ANSI Z97.1-1984 CPSC 16 CFR 1201 Category II.
   2. Mirror Glass Production and Fabrication
      a. Glass coating: coat second surface of glass, unless otherwise indicated, with glass coating system complying with FS DD-M-00411 requirements and consisting of successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard protective organic coating.
   3. Mirror Sizes: After application of glass coating, cut mirror glass to sizes as shown on Drawings and in 1/4 inch glass thickness.
   4. Edges: Seal edges after treatment to prevent chemical or atmospheric penetration of backing. Perform edge treatment and sealing in factory immediately after cutting to final sizes.

I. Provide CRL mirror mount system in satin anodized finish. Continuous top channel shall be two pieces, D1638 channel and D1637 cleat. Bottom and ends shall have D638 channel. System shall be as manufactured by C.R. Lawrence Company, Inc. (800-421-6144) or an approved equal.

2.3 GLAZING SEALANTS/COMPOUNDS

A. General:
   1. Provide materials as recommended by the manufacturer for the required application and condition of installation in each case.
   2. Provide only fully proven compounds that are compatible with surfaces contacted.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. Setting Blocks: Neoprene, 70-90 Durometer hardness, with proven compatibility of sealants used.
B. Spacers: Provide neoprene, 40-50 Durometer hardness, with proven compatibility of sealants used.
C. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

2.5 OTHER MATERIALS

A. Provide other materials not specifically described but required for a complete and proper installation.

PART 3 EXECUTION

3.1 INSTALLATION OF GLASS

A. General Requirements:
   1. Follow recommendations of the glass manufacturer and the sealant, gaskets and glazing materials manufacturer, except if the codes or listed references are more restrictive.
   2. Where a combination of sealing materials is required for glazing in the same frame, the manufacturer must certify that all glazing materials furnished are compatible with each other.
   3. Where setting blocks and spacer shims require setting into a glazing compound or sealant, contractor may butter them with the compound or sealant, then place them in position and allow to firmly setting prior to installation of glass.
B. Sash and Frame Preparation and Acceptance
   1. Inspect all window sash, frames, and surrounds glazed under this section and notify the Contractor of any defects, improper materials, or workmanship of other conditions that will affect the satisfactory installation of glass.
      a. Do not proceed with glazing until such conditions are acceptable.
      b. Absence of notification, or the beginning of glazing, will indicate acceptance of all previously placed related work executed by other trades.
   2. Other trades will execute the following work; but before starting glazing work, the glazier shall verify compliance with the requirements listed.
      a. That the sash and frames are firmly anchored in proper position, plumb and square within 1/8" nominal dimensions on approved shop drawings.

b. That the rivet, screw, bolt or nail heads, welding fillets and other projections are removed from glazing rabbets to provide the specified clearances.
c. That all corners and fabrication intersections are sealed and sash and frames are weather-tight.
d. That rabbets at seals weep to outside and all rabbets are of sufficient depth and width to receive the glass and provide the required overlap of the glass.
e. That all sealing surfaces of steel sash and frames are primer painted.

C. Preparation of Glass and Rabbets:
1. Clean the sealing surfaces of glass and the sealing surfaces of rabbets and stop beads before applying any glazing compound or gaskets.
2. Use only the approved solvents and cleaning agents recommended by the compound manufacturer.

D. Positioning Glass:
1. Center in glazing in the frame and rabbet to maintain specified clearances at perimeter on all four sides.
2. Maintain centered position of glass in rabbet and provide the required sealer thickness (⅛" maximum) on both sides of glass.
3. Whenever glass dimensions are larger than 50 united inches, provide setting blocks at the sill and spacer shims on all four sides; locate setting blocks one-quarter way in from each end of glass.

E. Stop Bead Glazing; Use Putty or Elastic Glazing Compound for bedding glass in hollow metal frames, except if other wise specified in this document.
1. Apply ample back putty or compound to rabbet so that it will ooze out when pressing glass into position and completely cover glass in rabbet.
a. Place setting blocks and spacer shims as required, and press glass into position.
2. Secure glass in place by the application of stop beads.
a. Bed stop beads against glass and bottom of rabbet with compound and/or putty, leaving proper thickness between glass and stop beads.
b. Secure stop beads in place with suitable fastenings.
c. Strip surplus compound or putty from both sides of glass and tool to provide clean sight lines.

F. Glazing - Using Glazing Gaskets
1. Use glass stops with glazing gaskets for securing glass in frames of all storefront type entrance-doors and in such other locations as indicated on the drawings.
2. Use glazing gaskets without stops for glazing glass in all storefront type sash and frames, except where as indicated on the drawings.
a. Install glazing of storefront type sash and frames using glazing gaskets without stops in strict accordance with the manufacturer's directions.
b. Provide and place setting blocks as required.
c. Gaskets shall be of the proper size for the thickness of installed glass.
d. After glazing, seal gaskets to glass continuously with a clear elastic and watertight sealant similar to G.E. Silicon Sealant.
e. Seal gaskets to glass on exterior face only.

3.2 REPLACEMENT AND CLEANING:

A. Upon completion of work, all glass shall be free from cracks and other defects.
B. Any defective or broken glass that may appear before acceptance or within the 1-year warranty period shall be removed and replaced with new glass without additional cost to the Owner;

excepting glass which is broken by a specific cause relating to building occupancy not relating to this contract.

C. Thoroughly wash and clean all glass upon completion of the work and just prior to occupancy of the building.

END OF SECTION

DIVISION 9 FINISHES

FINISH SCHEDULE LEGEND

MATERIAL ABBREVIATION	SPECIFICATION REFERENCE	MATERIAL
FLOOR MATERIALS		
CT	09 30 13	Ceramic Tile
BASE MATERIALS		
CT	09 30 13	Ceramic Tile
WALL FINISHES		
ARGWB	09 29 00	Abuse Resistant Gypsum Wallboard
GWB	09 29 00	Gypsum Wallboard
STU	09 24 00	Stucco
CEILING MATERIALS		
ACT-1	09 51 00	Acoustical Ceiling Tile Type 1, (Standard)
GWB	09 29 00	Gypsum Wallboard
STU	09 24 00	Suspended Stucco

FINISH SCHEDULE NOTES

1. GENERAL FINISH SCHEDULE NOTES APPLYING TO ALL SPACES:

1.1 Under Section 09 91 23 – Interior Painting and 09 91 13-Exterior Painting, paint exposed pipes, ductwork, breaching, conduit, insulated pipes, conduit hangers, supports, bracing, etc., which occurs in spaces scheduled to be painted in part or whole.

1.2 Materials and finishes noted in Finish Schedule are to be new, unless noted otherwise.

1.3 Painting and finishing of exterior surfaces as called for in the Painting and Finish Schedules and details shall be under the Work of Section 09 91 13 – Exterior Painting.

1.4 Under the Work of Section 09 91 23 – Interior Painting, paint exposed new exterior mechanical louvers, relief vents, vent stacks, ventilators, roof top HVAC units, steel handrails, hollow metal doors and frames, electrical items.

1.5 Interior doors, frames, and other miscellaneous surfaces not specifically identified in the Finish Schedule are to be painted or finished as listed under Specifications, Section 09 91 23 – Interior Painting, for the scheduled surfaces. This is to include all existing hollow metal frames and doors in the Buildings to remain. If any of the existing window frames are painted repaint the frames. Refinish all existing wood doors.

1.6 6 FT high CT in Restrooms. Provide a level 2 tile for Accent Tiles.

1.7 Install corner guards throughout project. 2" X 2" X 4' high.

1.8 Install new blinds on all windows located in renovated areas.

1.9 All areas of tile work must be sealed following the steps below:

Prolink Grout Cleaner – A special formulation of alkali, water soluble solvents, and detergents that penetrates dirt, grime, scum, and grease in grout. Grout cleaner suspends the soils for easy pick up with a wet vac. Mix 1:5. Apply generously, allow 10 minutes dwell time, scrub with grout brush or Grout Machine along grout lines in both directions, pick up dirty solution with Wet Vac, rinse with clear water, let dry.

Prolink Grout Brightener – The second step in a complete grout restoration system. A highly active, concentrated blend of acids that brighten and restore light colored grout to its original color. Will leave floors with a fresh mint scent. Mix 1:5. Apply to floor, scrub in both directions with grout brush or Grout Machine, remove with Wet Vac, rinse with clear water, let dry.

Prolink Grout Shield – The final step in a complete program. Grout Shield is a special penetrating siliconate coating that cures and protects new grout. It is a permanent coating that should be applied only to clean grout. If applied to dirty grout it will protect the grout as it appears at the time of application. Use RTU. Mist lightly with pump sprayer, do not overspray. Wipe excess product off of ceramic tile. Allow to dry (20-30 minutes) before walking on area

2. SPECIFIC FINISH SCHEDULE NOTES:

2.1 Ceramic Tile Wainscot to 6'-0" A.F.F.

2.2 Abuse Resistant Gypsum Wallboard to 8’-0” A.F.F. at main corridor side.

2.3 Cementitious wallboard substrate up to 6' A.F.F. to receive ceramic tile.

2.4 CT to match existing. Repair existing as required.

2.5 See ceiling plan for GWB bulkhead/soffit locations and heights.

FINISH SCHEDULE - VERO BEACH HIGH SCHOOL - FRESHMAN LEARNING CENTER

		BASE		FLOOR		WALLS						CEILING			
						MATERIALS				PAINT	NOTES				
ROOM NO.	ROOM NAME	MAT.	NOTES	MAT.	NOTES	NORTH	SOUTH	EAST	WEST			MATERIAL	HEIGHT	PAINT	NOTES
	COVERED ENTRY	-		CONC.		STU	STU	STU	STU			STU	8'-8"		
100	EXISTING CORRIDOR	CT	2.4	CT	2.4	ARGWB	EXIST	EXIST	EXIST		2.2	ACT-1	9'-0"		2.5
151	LOBBY	CT		CT		GWB	GWB	GWB	GWB			ACT-1	9'-6"		
152	RECEPTION	CT		CT		GWB	GWB	GWB	GWB			ACT-1	9'-0"		
153	SRO OFFICE	CT		CT		GWB	GWB	GWB	GWB			ACT-1	9'-0"		
154	RESTROOM	CT		CT		CT	CT	CT	CT		2.1 2.2	ACT-1	9'-0"		

SECTION 09 22 14
METAL FURRING AND LATHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Walls, bulkheads, and ceilings
   2. Metal lathing for wet plaster finish

1.3 REFERENCES

A. ASTM C841 – Standard Specification for the Installation of Interior Lathing and Furring
B. ASTM C847 – Standard Specification for Metal Lath
C. ASTM C933 – Standard Specification for Welded Wire Lath
D. ASTM C1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
E. GA-600 – Fire Resistance Design Manual
F. ML/SFA (Metal Lath / Steel Framing Association)–Specifications for Metal Lathing and Furring
G. ASCE 7 – Minimum Design Loads for Buildings and other Structures
H. Florida Building Code (FBC)

1.4 SUBMITTALS

A. Shop Drawings: Indicate prefabricated work, component details, stud layout, framed openings, anchorage, type, location of fasteners, and accessories or items required of other related work.
B. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and store off the floor in dry area.
   1. When moisture occurs, immediately remove water and allow members to completely dry.
B. Installation of rusted furring members is not acceptable.

PART 2 PRODUCTS

2.1 ACCEPTED MANUFACTURERS

A. Manufacturers subject to compliance with requirements, provide products of one of the following:

1. Gold Bond Building Products Div., National Gypsum Co.
2. Dale/Incor Industries
3. United States Gypsum Co.

2.2 FRAMING MATERIALS

A. Main Runner Channels; 1½" cold rolled, 16-ga steel, galvanized weight 500lb/1,000 LF.
B. Cross Furring Channels; ¾" cold rolled, 16-ga steel, galvanized weight 300lb/1,000 LF.
C. Hanger wire shall be 8-ga galvanized annealed.
D. Tie wire shall be 16-ga galvanized annealed for framing members.
E. Hangers: Galvanized steel, of size and type to suit application, rigidly support-ceiling components in place, and meet deflection limits as indicated.
F. Lateral Bracing: Formed steel; minimum 16-ga thick; size and length as required.
G. Casing Bead, formed zinc minimum 26-ga thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.
H. Corner Bead, formed zinc minimum 26-ga thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with radii edge.
I. Base Screed, formed zinc minimum 26-ga thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with beveled edge.
J. Control and Expansion Joint Accessories, formed zinc minimum 26-ga thick; accordion profile, 2" expanded metal flanges each side.
K. Install plaster frames for recessed light fixtures furnished by electrical contractor under this section.
L. Steel:
   1. Recycled Content: Provide post-consumer recycled and pre-consumer recycled content.

2.3 LATHING MATERIALS

A. Metal Lath; ASTM C847; self-furring mesh stamped sheet; 3.4 lb/sq ft.
B. Corner Mesh: Formed sheet steel; minimum 26-ga thick; expanded flanges shaped to permit complete embedding in plaster; minimum 4" size.
C. Strip Mesh: Expanded metal lath, minimum 26-ga thick 4" wide x 24" long.

2.4 ACCESSORIES

A. Tie wire, nails, screws and other supports, of type and size rigidly securing materials in place.

2.5 FINISHES

A. Framing Materials: Galvanized
B. Hangers, Anchors and Fastening Devices: Galvanized
C. Lath Materials: Galvanized

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions are ready to receive work.
B. Verify field measurements are as shown on drawings.
C. Beginning of installation means installer accepts existing conditions.

3.2 CEILING AND SOFFIT FRAMING

A. Install furring to height indicated, erect after above ceiling or soffit work is complete.
   1. Coordinate the location of hangers with other work.
B. Install furring independent of walls, columns and above ceiling work.
C. Securely anchor hangers to structural members or embed in structural slab.
   1. Space hangers to achieve deflection limits indicated.
D. Space the main carrying channels at maximum of 72" centers, and not more than 6" from walls.
   1. Lap the splices securely.
E. Securely fix carrying channels to hangers, prevent turning/twisting and transmit full load to hangers.
F. Place furring channels perpendicular to carrying channels, not more than 2" from perimeter walls, and rigidly secure.
   1. Lap the splices securely.
G. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing.
   1. Extend bracing minimum 24" past each opening.
H. Laterally brace suspension system.

3.3 CONTROL AND EXPANSION JOINTS

A. Install control and expansion joints with back-to-back casing beads set ¼" apart.
   1. Set both beads over 6" wide strip of polyethylene sheet to assist with air seal continuity.
B. Provide Control Joint Spacing as indicated on reflected ceiling plan.
C. Provide Expansion Joint Spacing as indicated on reflected ceiling plan.

3.4 LATHING

A. Apply metal lath taut, with long dimension perpendicular to supports.
B. Lap ends minimum 1", and secure end laps with tie wire where they occur between supports.
C. Lap sides of diamond mesh lath minimum 1½".
D. Attach metal lath to metal supports using tie wire at maximum 6" o. c.
E. Attach metal lath to concrete and concrete masonry using wirehair pins.
   1. Securely attach the anchors to backup surface and spaced a maximum 24" o. c.
F. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3" from corner to form the angle reinforcement; fasten at perimeter edges only.
G. Place corner bead at external wall corners; fasten at outer edges of lath only.
H. Place base screeds at termination of plaster areas; secure rigidly in place.
I. Place 4" wide strips of metal lath centered over junctions of dissimilar backing materials.
   1. Secure rigidly in place.
J. Place lath vertically above each top corner, each side of door, and glazed frame to 6" above ceiling.
K. Place casing beads at terminations of plaster finish.
   1. Butt and align ends.
   2. Secure rigidly in place.
L. Place strip mesh diagonally at corners of lathed openings.
   1. Secure rigidly in place.

3.5 TOLERANCES

A. Maximum Variation from True Position: ⅛" per 10'
B. Maximum Variation of any Member from Plane: ⅛"

3.6 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL STUD FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Metal studs
   2. Accessories

1.3 REFERENCES

A. ASTM A591/A591M – Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications.
B. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members
C. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
D. MFMA (Metal Framing Manufacturer's Association) – Guidelines for the Use of Metal Framing
E. ASCE 7 – Minimum Design Loads for Buildings and other Structures
F. Underwriters Laboratories (UL) – Fire Resistance Manual
G. Gypsum Association (GA) – Fire Resistance Design Manual
H. GA 203 – Installation of Screw Type Steel Framing Members to Receive Gypsum Board.
I. Florida Building Code (FBC)

1.4 SUBMITTALS

A. Shop Drawings: Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, type, location of fasteners, and accessories or items required of other related work.
B. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.
C. Provide calculations, from Florida professional engineer, for loadings and stresses of exterior walls to meet or exceed the requirements of ASCE 7.
D. Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.
E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
   1. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and store off the floor in dry area to prevent damage due to corrosion, moisture, excessive handling.
   1. When evidence of moisture occurs, immediately remove water and leave members completely dry.
B. Installation of rusted framing members is not acceptable.

PART 2 PRODUCTS

2.1 ACCEPTED MANUFACTURERS

A. Manufacturers subject to compliance with requirements, provide products of one of the following:
   1. Gold Bond Building Products Div., National Gypsum Co.
   2. Dale/Incor Industries
   3. United States Gypsum Co.

2.2 STUD FRAMING MATERIALS

A. Studs in interior partitions of at least 1⅝" x 3⅝" may be, 25-ga (less than 12' high), 22-ga or heavier (12'- 16' high), 20-ga or heavier (more than 16’ high), ASTM C645 "Specification for Design of Cold-Formed Steel Structural Members.
B. Provide minimum double 18-ga studs at window and door opening.
C. Exterior wall framing: Studs shall be 4" CEE 16-ga galvanized steel studs conforming to ASTM C1007 for load-bearing stud systems, and ASTM C754 for non-load (axial) bearing systems.
D. Floor and Ceiling Runners:
   1. Channel type metal runners, formed from 22-ga. galvanized steel, ASTM C645.
   2. Provide and install extended leg retainer on ceiling runners.
   3. Provide same gauge runners as studs.
E. Use studs, tracks, runners, and accessories formed from steel having a minimum G-90 galvanized coating.
F. Fasteners:
   1. Use Hex Washer Head Screw for framing member connections.
   2. Use Pan Tex Screw for framing member connections.
   3. Use Bugle Head Screw to attach gypsum lath to studs.
   4. Use Lath Tek Screw to attach metal lath to studs.
G. Steel:
   1. Recycled Content: Provide post-consumer recycled and pre-consumer recycled content.

2.3 STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Provide components complying with ASTM C 754 for materials and sizes unless otherwise indicated.
B. Tie wire and Hanger Wire: ASTM A641, Class 1 zinc coating, soft temper or of a material and size having superior corrosion resistance and equivalent strength to the galvanized steel wire specified.
   1. Tie wire shall be 18 gauge galvanized annealed wire.

2. Hanger wire shall be 8 gauge galvanized annealed wire.

C. Carrying Channels: Shall be 16 gauge galvanized cold rolled channels 1-1/2 inches deep, weighing a minimum of 475 pounds per thousand lineal feet. Protective coating shall be G40 hot-dip galvanized coating per ASTM A525.

D. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8 inch, and 0.0179 inch thick, unless otherwise indicated. Protective coating shall be G40 hot-dip galvanized coating per ASTM A525.

E. Grid Suspension System of Interior Ceilings: ASTM C645, manufacturer's standard direct hung grid suspension system composed of the main beams and cross furring members that interlock to form a modular supporting network.

2.4 STEEL FRAMING FOR WALLS AND PARTITIONS

A. Metal Studs: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16 inch wide minimum lip (return), and complying with the following requirements:
   1. Metal studs shall be hot dipped galvanized, ASTM A525 G40, punched "wide flange" channel sections with deep leg runner channels or base track where required. Width and spacing of studs shall be as indicated, but not less than that required to comply with ASTM C754 with maximum deflection L/120 of 5 lbf. per sq. ft.
   2. Unless indicated otherwise, metal stud framing shall be formed from the following gauge metal. If two conditions apply in the following listing, use the heavier gauge:
      a. Framing openings (heads and jambs) - 16 gauge
      b. Remaining metal studs - 20 gauge

B. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8 inch, and 0.0179 inch thick, unless otherwise indicated. Protective coating shall be G40 hot-dip galvanized coating per ASTM A525.

C. Z-Furring Members: Manufacturer’s standard Z-shaped furring members with slotted on nonslotted web, fabricated from steel complying with ASTM A 653; with a minimum base metal (uncoated) thickness of 0.0179 inch, face flange of 1-1/4 inch, wall attachment flange of 7/8 inch, and a depth required to fit insulation thickness indicated.

D. Deflection Track: Manufacturer’s top runner complying with the requirements of ASTM C645 and with 2 inch deep flanges.

E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; comply with the recommendations of gypsum board manufacturers for applications indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that conditions are ready to receive work.

B. Verify field measurements are as shown on drawings.

C. Verify that rough-in utilities are in proper location.

D. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C754 and with

ASTM C840 requirements that apply to framing installation.

1. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides.

B. Metal Stud Systems

1. Stud systems shall be set to the dimensions indicated on the Drawings.
    a. Where studs are installed directly against exterior walls, install felt strips or foam gaskets between studs and wall.
    b. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
        i) For STC rated and fire resistance rated partitions that extend to underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing and structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
    c. Install steel studs and furring in sizes and at spacings indicated.
        i) Space studs 16 inches o.c., unless otherwise indicated.
    d. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are internally raced.
        i) Fit gypsum panels around ducts, pipes, and conduits.
        ii) Where partitions intersect members projecting below underside of
        iii) Floor/roof slabs and decks, cut gypsum panels to fit profile formed by members - allow for deflection and sealant.
2. Align base and cap channel runner track accurately to the partition layout. Secure to concrete floor slabs and roof or floor decks above, with 1/2 inch concrete stud nails or other suitable fasteners, not over 24 inches o.c.
3. Assembly connections may be welded instead of screwed.
4. Install horizontal bridging not more than 48 inches apart in walls.
5. Install deep leg head track wherever wall extends to underside of roof or floor structure and provide space for structural deflection. Install one row of horizontal bridging parallel to and within 8 inches of head track. Do not attach studs to head track.
6. Install flat strap diagonal bracing at corners and wherever recommended by stud manufacturer.
7. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Install cripple studs at head adjacent to each jamb stud, with a minimum ½ inch clearance from jamb stud to allow for installation of control joints.
8. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
9. Install reinforcement within framing system including additional studs, bracing members, plates, channels, and angles to support furnishings or equipment furnished by other trades. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co. These items include, but are not limited to, the following:
    a. Recessed items: access panels, fire extinguisher cabinets, electrical boxes, openings

for ducts and pipes, miscellaneous electrical, mechanical, or structural penetrations.
b. Surface mounted items: handrails, grab bars, toilet accessories, curtain tracks, drapery hardware, wall mounted cabinets, corner guards, door stop, and other finish hardware.
c. Items anchored to walls: casework, toilet partitions, plumbing fixtures, lockers.

10. Do not bridge building expansion joints and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.
    a. Provide a maximum 1/2 inch gap at control joints and fill gap with mineral fiber safing.
11. Gauge of studs shall be increased to address increased heights as recommended by stud manufacturer.

C. Suspended Ceiling
1. Locate and suspend carrying channel runners 48 inches o.c. with wire hangers to structure above.
    a. Follow manufacturer's recommendation for wire hanger spacing. If structure above forces the wire hanger to exceed 48 inches, substitute steel studs for the carrying channel runners.
2. Install furring channels 24 inches o.c., perpendicular to channel runners above. Assemble components in accordance with manufacturer's instructions.
    a. Stagger butt connect furring tees for gypsum board panel end support.
3. Do not support ceilings directly from permanent metal forms.
4. Do not attach hangers to steel deck tabs.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
6. Do not connect or suspend steel framing from ducts, pipes or conduit.
7. For exterior soffits, install cross-bracing and additional framing to resist wind uplift, as required to comply with applicable codes and ordinances. As a minimum, provide uplift restraints which are vertical studs not over 3’-0” o.c. along horizontal carring channels.
8. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track

D. Brace stud-framing system and make rigid.
1. Provide and install bridging not to exceed 4'-3" o.c., unless using an approved engineered system.

E. Align stud web openings.
F. Coordinate installation of bucks, anchors, and blocking with electrical and mechanical work placed in or behind stud framing.
G. Blocking:
1. Secure metal stud blocking to studs.
2. Install blocking for support of plumbing fixtures, wall cabinets, counter tops, toilet partitions and accessories, hardware, and other items as indicated.
3. Provide and install, minimum 20-gage, horizontal doorstop blocking spanning 3-vertical studs at door handle height on the hinged side, starting at the doorframe.

H. All partitions shall extend through the ceiling system and be supported from the structure above.
1. See wall types shown on the drawings for exact requirements.

3.3 TOLERANCES

A. Maximum Variation from True Position is ⅛" per 10'
B. Maximum Variation of any Member from Plane is ⅛"

3.4 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 09 24 00
PORTLAND CEMENT PLASTER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. See plans and schedules for the extent of plasterwork.
   2. The type of plastering required includes:
      a. Portland Cement Plaster (Stucco)
      b. Smooth, aggregate and special rendered surface finishing.

1.3 REFERENCES

A. ASTM C91 – Standard Specification for Masonry Cement
B. ASTM C150 – Standard Specification for Portland Cement
C. ASTM C206 – Standard Specification for Finishing Hydrated Lime
D. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes
E. ASTM C631 – Standard Specification for Bonding Compounds for Interior Gypsum Plastering
F. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
G. ASTM C897 – Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters
H. ASTM C926 – Standard Specification for Application of Portland Cement-Based Plaster
I. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
J. NTMA – National Tile and Marble Association
K. PCA (Portland Cement Association) – Plaster (Stucco) Manual
L. Florida Building Code (FBC)

1.4 SYSTEM DESCRIPTION

A. Fabricate vertical elements to limit finish surface to 1/180 deflection under lateral point load of 100 lbs.
B. Fabricate horizontal elements to limit finish surface to 1/260 deflection under superimposed dead loads and wind uplift loads.

1.5 QUALITY ASSURANCE

A. Cement Plaster: Perform work in accordance with ASTM C926.
B. Allowable Tolerances: For flat surfaces, do not exceed ⅛" to 10'-0" for bow, warp, plumb, or level, including surfaces to receive applied finishes (tile, etc.).

C. This Contractor shall make sample panels at the site at least 4' x 4' of each type of plasterwork.
   1. The Architect and Owner shall accept the panels before Contractor starts plastering.
   2. The accepted panels will be a basis for all work.
D. Applicator shall show proof of specializing in lath and plaster work for a minimum of 5-years.

1.6 SUBMITTALS

A. Submit under the provisions of Section 01 33 00.
B. Manufacturer's Data Plaster:
   1. For information only, submit copies of the manufacturer's product specifications and installation instructions for each material, and include other data as may be required to show compliance with these specifications.
   2. Distribute an additional copy of each installation instruction to the Installer.
C. Product Data: Provide data describing standard framing member materials and finish, product criteria, load charts and limitations.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASTM E119 and applicable code for fire rated assemblies as follows:
   1. Fire Rated Partitions: Listed assembly by UL or FM.
   2. Fire Rated Ceiling and Soffits: Listed assembly by UL or FM
   3. Fire Rated Structural Column Framing: Listed assembly by UL or FM.
   4. Fire Rated Structural Beam Framing: Listed assembly by UL or FM.

1.8 PRODUCT HANDLING

A. Except for sand and water, deliver materials to the site in sealed containers or bags fully identified with manufacturer's name, brand, type, and grade.
B. Store all materials in a dry, well-ventilated space, under cover and off the ground.

1.9 JOB CONDITIONS

A. Installer must examine surfaces that are to receive plaster, repair, alter, and prepare surfaces to insure a timely completion of the work.
   1. Do not start the plasterwork until any unsatisfactory conditions are corrected in an acceptable manner to the Installer and Architect.
B. Temporary Heat and Ventilation: Comply with ANSI A42.1 and A42.2 as applicable to the work.
C. Do not apply plaster when ambient temperature is less than 50°F both during installation and until cured.
D. Protect contiguous work from soiling, spattering, moisture deterioration, and other harmful effects, which might result from plastering.

PART 2 PRODUCTS

2.1 PLASTER BASE COAT MATERIALS

A. Cement: ASTM C150, Type I Portland
B. Lime: ASTM C206, Type S

C. Aggregate: In accordance with ASTM C897
D. Water: Clean, fresh, potable, and free of mineral or organic material that may affect plaster.
E. Admixtures: Air entrainment

2.2 PLASTER FINISH COAT MATERIALS

A. Cement: As specified for plaster base coat
B. Lime: As specified for plaster base coat
C. Color Pigment: Mineral oxide
D. Water: Clean, fresh, potable, and free of mineral or organic matter that can affect plaster.

2.3 CEMENT PLASTER MATERIALS (STUCCO)

A. Job mixed Stucco - Mix bondcrete or mortaseal mason's lime with Portland cement and sand according to ASTM C926, in Portland cement: lime: sand ratios (bags: bags: cu ft) as follows:
   1. Basecoat - Scratch coat 1:1:8 and Brown coat 1:1:10.
   2. Finish - Apply exterior stucco finish in accordance with U.S. Gypsum data sheet P-541.
   3. Skim Coat: Provide smooth textured skim coat where scheduled on drawings.
   4. Finish Texture: As shown on the drawings and/or finish schedule.

2.4 BONDING AGENT

A. Conform to ASTM C1059.
B. Exterior applications and areas exposed to water immersion or to high humidity: A non re-emulsifiable acrylic emulsion. To be used as integrally mixed product when recommended by the Portland Stucco System Manufacturer.
   1. Products:
      a. Thoroseal/Acryl 60, as manufactured by Harris Specialty Chemicals, Inc.
      b. Bonsal Acrylic Additive by W.R. Bonsal Company.
      c. Silkalatex, as manufactured by Sika Chemical Corporation.
   2. Products are to be delivered to job site premixed in the water at specified ratios.
C. Interior Applications: In areas not subject to water immersion or high humidity; a re-emulsifiable P.V.A. (Bonding agent: Where exposed to water immersion or high humidity, comply with 2.01 I.2, as noted above.)
   1. Solids: a minimum of 50 percent.
   2. Tensile Strength: a minimum of 500 p.s.i.
   3. Shear Strength: a minimum of 300 p.s.i.

2.5 WATERPROOFING

A. Lambert Corporation - Hydrocel - one quart per sack of cement.
B. Master Builders - Omicron Mortar proofing, one pound per sack of cement.
C. A.C. Horn - Hydratite, two quarts per sack of cement

2.6 PLASTIC ACCESSORIES

A. Accessories, Beads, and Moldings (on wire lath and interior applications): Extruded Polyvinylchloride (PVC). Provide in profile and locations shown on drawings.
B. Control and Expansion Joint Moldings (on wire lath and interior applications):

1. As manufactured by Fry Reglet Corporation “Fry Plaster Expan-O-Screed” Type PES-75-25.
2. Conform to ASTM D1784, Type II.
3. 0.050 inch thick polyvinylchloride (PVC).

C. Color: off-white.
D. 10 foot lengths.
E. Provide with the following accessories:
1. Connector clips: Polyvinylchloride (PVC) plastic clips for aligning continuous lengths of molding.
2. Notch-Lok Connections: Polyvinylchloride back plates for aligning intersecting lengths of moldings.
3. “+” and “T” Intersections: Factory fabricated intersections used to connect horizontal and vertical joints of moldings.

F. All joints between any type of accessory or joint shall be sealed per manufacturing recommendations before plastering.
G. Reveal Moldings (on wire lath and interior applications):
1. As manufactured by Fry Reglet Corporation “F” Molding Type FPM-75-75.
2. Conform to ASTM D1784, Type II.
3. 0.050 inch thick polyvinylchloride (PVC).
4. Color: off-white.
5. 10 foot lengths.

H. Exterior Building Structural Expansion Joints over concrete:
1. As manufactured by Fry Reglet Corporation “J” Modling Type JPM-75.
2. Conform to ASTM D1784, Type II.
3. 0.050 inch thick Polyvinylchloride (PVC).
4. Color: off-white.
5. 10 foot lengths.

I. Exterior Building “V” control joint.
1. As manufacturer by Plastic Components, Inc. #2058
2. Conform to ASTM D1784, C1063, and D4216-99.
3. 0.050 inch thick PVC
4. Color – White
5. 10 foot length
6. Caulk all butt joints, intersections and ends. Per manufacturer’s installation instructions

PART 3 EXECUTION

3.1 PREPARATION FOR PLASTERING

A. Clean plaster bases and substrates to be plastered, removing loose materials, coatings, and other substances that might impair the work.
B. Etch concrete and masonry surfaces indicated for direct plastering.
1. Wet surface, scrub with acid etch solution, and rinse thoroughly; repeat if necessary for adequate plaster bond.

C. Apply dash-coat on concrete surfaces receiving direct plastering, and moisture-cure for 2-days.
D. Apply bonding agent on interior concrete surfaces indicated for direct plastering; comply with manufacturer's instructions.
E. Cover chases and similar openings in the surfaces to receive plaster with metal lath strip

reinforcing, extending not less than 6" beyond edges of opening.
1. Securely fasten lath along edges.

F. Install temporary grounds and screeds as required to control plaster thickness and comply with tolerances.
G. Install plastering accessories, anchored to substrates 8" o. c. along each flange.
1. Miter corners and spline joints to form tight accurate joints without offsets.
2. Install screws in all accessories at a maximum of 4'0" o. c. as well as clinched into place.
3. Install resilient-edged casing beads for interior work against exterior-wall door and window frames, and at similar locations as indicated.
4. Control Joints: Install control joints at locations indicated, or if not indicated, at locations complying with the following criteria and approved by Architect.
a. Where an expansion or control joint occurs in the construction surface directly behind the plaster membrane, continue the joint through the plaster.
b. Where distance between control joints exceed 10' in either direction.
c. Where plaster panels exceed an area of 100 sq ft.
d. Where panel sizes or dimensions change, extend joints full width or height.

H. Surface Conditioning: Immediately before applying plaster to concrete or masonry, except when using a bonding agent, dampen the surfaces sufficiently to obtain optimum plaster suction.
I. Caulk with sealant all PVC intersections, joints, and connections before application of plaster.

3.2 INSTALLATION OF PLASTER

A. General: Comply with ASTM C926; except comply with manufacturer's instructions where more detailed or more stringent.
B. Plaster Thickness and Number of Coats:
1. Thickness on Vertical Surfaces: Except as otherwise indicated or specified, the minimum thickness of plaster as measured from face of lath, masonry, or concrete to finished plaster surfaces shall be as follows:
a. Exterior Portland Cement Plaster: ⅝".
b. Interior Portland Cement Plaster: ⅞".
c. Plaster on unit masonry surfaces: ½".
d. Plaster on concrete surfaces: ⅝"
e. Plaster skim coat on interior masonry surfaces: ¼"
2. Thickness on Horizontal Surfaces: Per ASTM C926
3. Number of Coats: Plaster on unit masonry surfaces 2-coats; on concrete or applied over bonding agents, 3-coats; doubling back with brown coat over scratch coat before it is partially dry and set will not be permitted on 3-coat work.

C. Mechanically mix plaster materials at the project site; do not hand mix except when requiring amounts of less than 1-bag.
D. Sequence the plaster installation properly with the installation and protection of other work, to prevent damage to either installation.
E. Apply skim-coat plaster with a minimum thickness scratch and leveling coat and a normal minimum thickness finish coat.
F. Cure Plaster by maintaining each coat in a moist condition for 2-days following application; keep enclosed and fog-spray (after initial set) as required to prevent dry-out.

3.3 CUTTING AND PATCHING

A. Cut, patch, point-up, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections.
B. Repair or replace work to eliminate blisters, buckles, excessive crazing and check crackling, dry-outs, efflorescence, sweat-outs, and similar defects, including areas of the work which do not comply with specified tolerances, and where bond to the substrate has failed.
C. Sand smooth-trowel finishes lightly removing trowel marks and arises.

3.4 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work.
   1. Promptly remove plaster from doorframes, windows, and other surfaces not requiring plaster.
   2. Repair floors, walls, and other surfaces stained, marred, or damaged from plastering work.
   3. When plastering work is complete, remove unused materials, containers, and equipment, clean floors of plaster debris.
B. Installer shall advise the Contractor of requirements for the protection of plaster from deterioration and damage during the remainder of the construction period.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Gypsum Board Partition Systems
   2. Gypsum Board Accessories
   3. Joint Treatment
   4. Textured Finish

1.3 REFERENCES

A. ASTM C36/C36M – Standard Specification for Gypsum Wallboard
B. ASTM C79/C79M – Standard Specification for Treated Core and Nontreated Core Gypsum Sheathing Board
C. ASTM C442/C442M – Standard Specification for Gypsum Backing Board and Coreboard, and Gypsum Shaftliner Board
D. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
E. ASTM C630/C630M – Standard Specification for Water Resistant Gypsum Backing Board
F. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members
G. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products
H. ASTM C931/C931M – Standard Specification for Exterior Gypsum Soffit Board
I. ASTM E695 – Standard method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact loading
J. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
K. ASTM D5420 – Standard Test Method for Impact Resistance of Flat Rigid Plastic Specimen By Means of a Striker Impacted by Falling Weight (Gardner Impact)
L. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
M. ASTM C840 – Standard Specification for the Application and Finishing of Gypsum Board
N. GA 201 – Using Gypsum Board for Walls and Ceilings
O. GA-216 – Recommended Specifications for the Application and Finishing of Gypsum Board
P. GA-600 – Fire Resistance Design Manual
Q. Florida Building Code (FBC)

1.4 SUBMITTALS

A. Product Submittal: Submit manufacturer's product data sheets and printed installation instructions for each product or system proposed for use.

1.5 QUALITY ASSURANCE

A. Perform gypsum board systems work in accordance with recommendations of ASTM C754, C840, and GA-216 except as otherwise specified in this Section.
B. Regulatory Requirements:
   1. Fire-rated Assemblies: Listed and rated by Underwriter's Laboratories, Inc. or generic fire resistance ratings listed in GA-600.
   2. Fire-Hazard Classification: Listed and labeled by Underwriter's Laboratories, Inc.

1.6 MOCK UP

A. Provide an 8' x 8" finish wall mock up of an area within the building selected by the Architect. The approved mock up will be the standard of comparison for the remainder of the walls within the project.

1.7 COORDINATION

A. Prior to and during installation, coordinate with work of other trades to facilities required openings and finishes.
B. Conduct pre-construction meeting with drywall contractor, architect, owner, project coordinator, and others involved with process.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store the material off the floor in dry area to prevent damage from moisture or excessive handling.
B. Follow manufacturer's requirements for on site storage and handling of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. U.S. Gypsum Co products listed as a standard of quality.
B. Use products manufactured by United States based companies only, do not use drywall manufactured in China.
   1. National Gypsum Corp
   2. U.S. Gypsum Corp
   3. Georgia-Pacific Corp
   4. Lafarge North America Inc
   5. Other approved equal
C. All gypsum board products shall have minimum mold growth ASTM D3273 rating of 10.

2.2 MATERIALS

A. Furring Channels: USG metal stud channel, 1½" deep, roll-formed sections of 20-ga galvanized steel, ASTM C645

B. Gypsum Wallboard (General and above 8' AFF): ⅝" thick, ASTM C36/C36M, tapered edge, fire rated Type X. (Note: At radius walls the Contractor has the option to install ¼" and/or ⅜" thick gypsum wallboard in layers.)
C. Gypsum Wallboard (Corridors, stairways, cafeteria, stage, and gymnasium up to at least 8' AFF minimum): Abuse resistant brand, ⅝" thick, ASTM C36/C36M, tapered edge, fire rated Type X. (Note: At radius walls the Contractor has the option to install ¼" and/or ⅜" thick gypsum wallboard in layers.)
    1. Acceptable abuse resistant drywall:
        a. Fiber Rock VHI by USG
        b. Hi-Abuse-XP Gypsum Wallboard by National Gypsum
        c. DensArmor by Georgia Pacific
        d. Protecta AR 100 by LaFarge
        e. Or approved equal
    2. Recycled Content: Provide post-consumer recycled or pre-consumer recycled content.
D. Water Resistant Gypsum Wallboard: ⅝" thick, tapered edge
    1. Provide at "wet" areas (areas subject to contact with water).
    2. Wet locations use DensArmor Plus Interior Guard or equal product by other approved manufacturers in 2.1 of this section.
    3. If for ceramic tile backing, use DensShield Tile Guard by GP or equal product by other approved manufacturers in 2.1 of this section.
E. Exterior Gypsum Soffit Board: Standard or Fire Rated type, tapered edges, ends square cut, ASTM C931.
F. Gypsum Backing Board: Standard or Fire Rated type, square edges, ASTM C442/C442M.
G. Gypsum Sheathing 5/8" thick exterior water resistant board for metal framing systems with book tongue and grooved edges.
    1. Acceptable product shall be DensGlass Gold Exterior Guard, or similar product by other approved manufacturers in 2.1 of this section.
H. Sound Board: Acoustically enhanced gypsum board shall be 5/8" thick, Type "X" sound break as manufactured by National Gypsum Co. or approved equal. Gypsum board shall be moisture resistant and comply with ASTM D 3273, score of 10 and comply with ASTM G21, score of 0.
I. Compounds: Pre-fill powdered joint compound, laminating adhesive, taping compound and topping compound, ASTM C475.
J. Joint Tape; use perforated tape per ASTM C475.
    1. Toxicity/IEQ: Sheetrock Joint Tape. Paper; fiberglass joint tape not permitted.
K. Fasteners; Self-drilling, self-tapping bugle head screws, Type S12 and GA 216, length required for each assembly.
L. Metal Accessories:
    1. Corner Beads; Dur-A-Bead No. 101, galvanized or plastic.
    2. Metal Trim (Casing Bead): No. 200-A or 200-B metal trim, galvanized or plastic.
M. Interior Expansion Joint Covers: Balco Inc. or equal;
    1. Walls – Use Type 6ADW-1 and 6ADWC-1 or type as recommended by manufacturer.
N. Cementitious Backer Board: Complying with ANSI A118.9 of thickness indicated and in maximum lengths available to minimize end-to-end butt joints. Ends and edges shall be square cut and finished smooth; formed in a continuous process of aggregated portland cement slurry; and reinforced with vinyl coated, woven glass-fiber mesh embedded in both surfaces used in toilet room walls receiving tile.
    1. Thickness: Manufacturer's standard thickness, but not less than 7/16 inch, unless otherwise indicated.
    2. Products: Subject to compliance with requirements, provide one of the following products:
    3. Wonderboard Multi-Board; Custom Building Products

O. Texture Compound: Acrylic texture coating DS4000 as manufactured by TWI.
P. Finish: Gypsum wall board finish shall be knockdown with final approval of mock-up by the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction for conditions that prevent proper installation of drywall systems.
B. Do not proceed until defects are corrected.

3.2 METAL FRAMING INSTALLATION

A. General:
   1. Install metal framing in accordance with ASTM C754 except as otherwise specified.
   2. Install the members true to line and level to provide surface flatness with maximum variation of ⅛" in 10' in any direction.
   3. Install metal studs at 16" o.c. unless noted otherwise.
B. Metal Furring Channels
   1. Secure to masonry walls and around door and window openings, intersections, and corners with low velocity power driven anchors.
   2. Install metal furring at 16" o.c. vertically.
   3. Extend furring on exterior walls full height of wall.

3.3 GYPSUM BOARD SYSTEM INSTALLATION

A. Install in strict accordance with GA-201, GA-216 and GA-600, do not install until building is dried in.
B. Maximum variation in flatness required is ⅛" in 10'.
C. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
D. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling.
   1. Stagger abutting end joints of adjacent panel not less than one framing member.
E. Install gypsum panels with face side out.
   1. Do not install imperfect, damaged, or damp panels.
   2. Butt panels together for a light contact at edges and ends with not more than $^{1}/_{16}$" of open space between panels.
   3. Do not force into place.
F. Locate both edge or end joints over supports, except in ceiling applications where providing intermediate supports or gypsum board back blocking behind end joints.
   1. Do not place tapered edges against cut edges or ends.
   2. Stagger vertical joints on opposite sides of partitions.
   3. Avoid joints other than control joints at corners of framed openings where possible.
G. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
H. Attach gypsum panels to framing provided at openings and cutouts.
I. Spot grout hollow metal doorframes for solid-core wood doors, and hollow metal doors.

1. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

J. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

K. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Except in concealed applications indicating or requiring sound, fire, air, or smoke ratings, may use scraps of not less than 8 sf in.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow ¼" - ⅜" wide joints to install sealant.

L. Isolate perimeter of non load-bearing gypsum board partitions at structural abutments, except floors, as detailed.
   1. Provide ¼" - ½" wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed.
   2. Seal joints between edges and abutting structural surfaces with acoustical sealant.

M. In STC-rated gypsum board assemblies, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant at both faces of the partitions.
   1. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

N. Space the fasteners in gypsum panels according to GA-216, finishing standard, and manufacturer's recommendations.

3.4 ACCESSORIES INSTALLATION

A. Corner Beads: Install on external corners, with screws spaced 8" o.c. both sides.

B. Trim: Install over face-layer gypsum board with fasteners spaced 8" o.c. Install where gypsum board surfaces meet dissimilar surfaces and at other detailed locations.

C. Corner beads and trim may be either galvanized metal or plastic.

3.5 JOINT TREATMENT

A. Treat joints, interior angles, fastener depressions, and finishing trim on face-layer gypsum board, including gypsum board in ceiling plenums.

B. Pre-fill, tape, fill, and finish in accordance with manufacturer's directions.

C. Apply a thin skim coat of joint compound over entire surface of gypsum board.

D. Sand finish coat and leave surfaces smooth, uniform, and free of fins, depressions, cracks and other imperfections.

3.6 FINISHING GYPSUM BOARD ASSEMBLIES

A. Gypsum board wall finish shall be knockdown with texture as approved by the Architect..
   1. Level 0: No taping, finishing, or accessories required. This level of finish shall be used in temporary construction only.
   2. Level 1: Joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. This finish

level shall be used in plenum areas above ceilings, in attics, in areas where the assembly is concealed.

3. Level 2: Joints and interior angles shall have tape embedded in joint compound, and one separate coat of joint compound applied over joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. This finish level shall be used where water resistant gypsum backing board (ASTM C630) is used as a substrate for tile only.
4. Level 3: Joints and interior angles shall have tape embedded in joint compound, and two separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a primer/sealer prior to the application of final finishes. See painting/wall covering specification in this regard. This final level shall be used in areas which are to receive heavy textured, thick (1/8 inch or greater) wall coverings.
5. Level 4: Joints and interior angles shall have tape embedded in joint compound, and three separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Joint compound shall be smooth and free of tool marks and ridges. Note: Prepare surface to be coated with a primer/sealer prior to the application of final finishes. This finish level shall be used where textured finishes, wall coverings, and painted (flat or eggshell) finishes are to be applied.
6. Level 5: Joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Note: Prepare surface to be coated with a primer/sealer prior to the application of finish paint. This finish level shall be used with semi-gloss or gloss painted finishes and where indicated on the Room Finish Schedule.

3.7 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Multi-layer gypsum board: Screw attachment. Adhesive attachment will not be permitted.
B. Waste Management: As specified and as follows:
   1. Select panel sizes and layout panels to minimize waste; reuse cutoffs to the greatest extent possible.

END OF SECTION

SECTION 09 30 13
CERAMIC TILE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. This Contractor shall furnish and install all tile and accessories shown on the plans or specified.

1.3 REFERENCES

A. ANSI/CTI A108/A118/A136.1 - Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI/CTI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, 108.4 -.13, A118.1-.10, ANSI A136.1
B. ANSI/CTI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar
C. ANSI/CTI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive
D. ANSI/CTI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar
E. ANSI/CTI A108.6 - Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy
F. ANSI/CTI A108.8 - Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout
G. ANSI/CTI A108.9 - Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout
H. ANSI/CTI A108.10 - Installation of Grout in Tile work
I. ANSI/CTI A118.1 - Dry-Set Portland Cement Mortar
J. ANSI/CTI A118.3 - Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive
K. ANSI/CTI A118.4 - Latex-Portland Cement Mortar
L. ANSI/CTI A118.5 - Chemical Resistant Furan Mortars and Grouts for Tile Installation
M. ANSI/CTI A118.6 - Ceramic Tile Grouts
N. ANSI/CTI A118.8 - Modified Epoxy Emulsion Mortar/Grout
O. ANSI/CTI A136.1 - Organic Adhesive for Installation of Ceramic Tile
P. ANSI/CTI A137.1 - Ceramic Tile
Q. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
R. ASTM C206 - Standard Specification for Finishing Hydrated Lime
S. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
T. TCA CTI - (Tile Council of North America) - Handbook for Ceramic Tile Installation

1.4 JOB CONDITIONS

A. This Contractor shall inspect the job conditions before starting, and his starting work constitutes approval of conditions.
B. All flooring variations less than 1/8” in 10 ft., chips, and cracks are the responsibility of the flooring subcontractor to feather/patch prior to the installation of tile.

1.5 SUBMITTALS

A. Submit manufacturer’s detailed technical data and tile and grout samples per Section 01 33 00.
B. Product Data: Provide instruction for using adhesives and grouts.
C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, and junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.
D. Manufacturer's Certificate: Certify that products meet or exceed ANSI A137.1.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, packaged with protective covering for storage, and identified with labels describing contents.
B. Furnish quantity of full-size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 CERAMIC TILE (CT)

A. Tile Products manufactured by American Olean, Dal-Tile, Inter-Ceramic, or US Tile are acceptable, providing their products equal or exceed the type and quality of the specified products and the colors match the colors specified.
B. Provide standard grade ceramic price group 1 and 2 glazed wall tile conforming to ANSI A137.1.
C. Provide 5/16" thick standard size as shown on plans with matte glazed tile and cushioned edge.
    1. Use master-set, back mounted sheets.
D. Provide standard grade ceramic unglazed floor tile conforming to ANSI A137.1.
    1. Tile shall meet or exceed the ADAAG slip resistance coefficient of 0.6 on static surfaces and 0.8 on ramps, and submit documentation to Architect.
    2. Provide 5/16" thick standard size as shown on plans with matte unglazed tile and cushioned edge.
    3. Use master-set, back mounted sheets.
E. Glazed Wall Tile Trim, provide the following:
    1. Trim in a size, color, and shade to match field tile.
    2. Bull nose wainscot cap where required.
    3. In a standard, square top, cove base at tile floors.
    4. In a square top, set-on type, cove base at other floors.
    5. Square edges at inside corners.
    6. Bull nose edges at outside corners and jambs.

2.2 CERAMIC MOSAIC TILE (CMT)

A. Tile Products manufactured by American Olean, Dal-Tile, Inter-Ceramic, or US Tile are acceptable, providing their products equal or exceed the type and quality of the specified products and the colors match the colors specified.
   1. Tile shall meet or exceed the ADAAG slip resistance coefficient of 0.6 on static surfaces and 0.8 on ramps, and submit documentation to Architect.
B. Provide standard grade ceramic price group 1 and 2 mosaics conforming to ANSI A137.1.
C. Provide standard 2" square by ¼" thick porcelain type with all purpose edges and patterns.
D. Use master-set, back mounted sheets.
E. Furnish with 7½% abrasive grain content in wet areas only.

2.3 MATERIALS

A. Anti-Fracture Membrane/Cleavage Membrane: As indicated on the drawings, and elsewhere as required for isolating the installation from cracking due to minor substrate movement and normal structural deflections.
B. Waterproofing and Anti-Fracture Membrane: As indicated on the drawings, and elsewhere as required for thin-set tile installations complying with ANSI 118.10 for waterproof membranes.
C. Sound Control/Acoustical Underlayment: As indicated on the drawings, and elsewhere as required to be load bearing, shock, and vibration resistant.
D. Moisture Barrier System: As indicated on the drawings and elsewhere as required for thin-set tile installations.
E. Self-Leveling Underlayment: As indicated on the drawings, and elsewhere as required to provide a flat, level surface for direct receipt of tile and other floor coverings on dry, interior installations.
F. Mortar Bed Installations: As indicated on the drawings, and elsewhere as required for mortar bed or brown coat as the substrate for tile work; work to conform to ANSI A108.1.
G. Cementitious Backer Units: ANSI A118.9 as indicated on the drawings, and elsewhere as required for floors and walls, interior and/or exterior, wet areas, and dry as recommended substrate for tile, fire rated wall installations, heat shield with UL listing for floors and walls; installation to comply with ANSI A108.11 and manufacturer's installation instructions.
   1. ½” Wonder Board Backer board (Exterior or Interior Floors, Walls, Ceilings, Countertops).
H. Cementitious Tile Adhesives:
   1. ANSI A118.1: As indicated on the drawings, and elsewhere as required for setting tile as specified by ANSI A108.5, Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, over substrates prepared accordingly.
   2. ANSI A118.4: Polymer-Enhanced Mortars:
   3. Latex Additives: As specified, a latex additive is to be used as the mixing liquid, per manufacturer's direction, with certain pre-packaged, dry-set mortar mixes, to achieve a Latex Portland Cement Dry Set Mortar complying with ANSI A118.4.
I. Organic Tile Adhesives:
   1. ANSI A136.1: As indicated on the drawings, and elsewhere as required for setting tile as specified by ANSI 108.4, Organic Adhesives, over substrates prepared accordingly.
J. Epoxy Tile Adhesives:
   1. ANSI A118.3: As indicated on the drawings, and elsewhere as required for setting tile as specified by ANSI A108.6 Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy, over substrates prepared accordingly.
K. Grout: As indicated on the drawings, and elsewhere as required for filling the joints between tiles.
   1. Polymer-Modified Portland Cement Grout:
   2. Dry-Set Grout: Use grout meeting ANSI A118.6, for joints up to 1/8”.

3. Chemical Resistant, As indicated on the drawing and elsewhere as required provide Water-Cleanable Tile Setting and Grouting Epoxy; per ANSI A118.3.
4. Elastomeric Joint Caulk: ANSI A108.01.3.7 as indicated on the drawings and elsewhere as required provide in all joints between floors and walls and at joints between tile and dissimilar materials.

2.4 ACCESSORIES

A. The Contractor to supply all necessary base, cap edge corner, trim, or accessory tiles required for a complete installation.
B. Shower Pan Membrane (use at shower and drying rooms)
   1. Mud-Set Method: Shall be equal to “Chloraloy” 40 mil chlorinated polyethylene shower pan membrane by The Noble Co.
   2. Thin-Set Method: Shall be equal to “Nobleseal TS” 30 mil chlorinated polyethylene sheet membrane as manufactured by The Noble Co.
C. Use marble thresholds at all changes of materials, maximum of ½” thick to meet handicap requirements.
D. Sealer – after cleaning, apply two coats of joint sealer per manufacturer’s recommendations.
   1. Aqua Mix Grout Sealer
   2. Other product equal to the above
E. Install layout, pattern, and colors as designed by the Architect.
   1. Primary Color – approx. 55%
   2. Secondary Color – approx. 25%
   3. Tertiary Color – approx. 15%
   4. Accent Colors – approx. 5%
F. Corner trim shall be used at outside corners and shall be the Rondec in aluminum as manufactured by Schluter Systems.
   1. Edge trim shall be used where tile ends on a flat plane such as a wainscoat, drinking fountain surround, etc. and shall be the Jolly in aluminum as manufactured by Schluter systems.

PART 3 EXECUTION

3.1 INSPECTION

A. This Contractor shall notify the General Contractor when he has completed his work and is ready for inspection.

3.2 INSTALLATION

A. Install tile, per TCA F113-90 sloping to floor drains, where applicable, in accordance with ANSI specification A-108.5.
   1. Install wall tile per TCAW202-90.
B. Install tile in grid pattern with continuous and properly aligned joints in all directions.
C. Install thresholds at all wall openings where tile abuts other floor finishes.
   1. Provide maximum threshold height ¼" for HDCP requirements.
   2. A threshold up to ½" in height maybe installed, if it has edges beveled at 1:2 slope.
D. Provide a ⅛" joint between the tile, and the doorframe or other item of dissimilar material then use a sealant over the joint instead of grout.
   1. Caulk the joints with caulking compound that matches grout.

E. Space tiles a minimum of ½-tile width from corners and edges.
F. Use masonry saw to cut tile unless Architect and Owner approve another method.
G. Install accent wall tile level and true to line and flush with stucco surface.
H. Floor tile in toilet rooms shall be epoxy grouted.

3.3 ADJUSTMENT AND CLEANING:

A. Upon completion of the building, all finishes shall be free of all mars, dents, or other visible imperfections.

3.4 WARRANTY:

A. This Contractor shall fully guarantee all materials and labor under this section for a period of not less than 1-year from date of final acceptance of the building against all defects in both workmanship and materials, and he shall promptly correct and/or replace such faulty work if so notified.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Acoustical lay-in ceilings and metal grid suspension system

1.3 REFERENCES

A. ASTM C635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
B. ASTM C636 – Standard Practice for the Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
C. ASTM C665 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
D. ASTM E1264 – Standard Classification of Acoustical Ceiling Products
E. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice
F. UL – Fre Resistance Directory and Building Material Directory
G. Florida Building Code (FBC)

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
   1. Product data for each type of product specified.
   2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.
      a. 6" square samples of each acoustical panel type, pattern, and color
      b. Set of 12" long samples of exposed suspension system members, including moldings, for each color and system type required.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics:
   1. Provide acoustical ceilings that are identical to those tested for the following fire performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.

2. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
    a. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
        i) Flame Spread: 25 or less.
        ii) Smoke Developed: 50 or less.

B. Single Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

C. Single Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units and suspension system components to Project site in original, unopened packages.
    1. Store in a clean dry fully enclosed space and protect against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Install interior acoustical ceilings only when space is enclosed and weatherproof, wet work in space is complete and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity are at values near those for final occupancy.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below matching installed products, packaged with protective covering for storage, and are identified with labels describing contents.
    1. Acoustical Ceiling Units: Full size units equal to 2% of amount installed.
    2. Suspension System Components: Furnish quantity of each exposed component equal to 2% of amount installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following:
    1. Mineral Base Panels typical unless noted on Reflected Ceiling Plans. Tiles shall be non-directional, resistant to high humidity and growth of mold/mildew, with Painted Finish Perforated and Fissured Pattern, and Class ‘A’ finish, Color: White.
        a. General-ACT-1
            i) Armstrong World Industries "Fine Fissured" with HumiGuard Plus Square Lay-in.
            ii) Celotex Corp. (BPB Corp) "Baroque High NRC" with BioShield
            iii) USG Interiors Radar Climaplus
            iv) Tiles shall be 24" x 24" non-directional

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, and the grid system shall be compatible with the tiles to provide resistant to high humidity and growth of mold/mildew:
   1. Non-Fire-Resistance Rated Double-Web Steel Suspension Systems:
      a. Armstrong World Industries, Inc.
      b. Chicago Metallic Corporation.
      c. USG Interiors, Inc.
      d. CertianTeed Ceilings
   2. Edge Moldings:
      a. Armstrong World Industries, Inc.
      b. Chicago Metallic Corporation.
      c. Fry Reglet Corp.
      d. USG Interiors, Inc.
      e. CertianTeed Ceilings

2.2 ACOUSTICAL CEILING UNITS, GENERAL

A. Standard for Acoustical Ceiling Units: Provide manufacturers' standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Use type E 400 (plenum mounting in which face of test specimen is 15-3/4" away from the test surface) per ASTM E 795.
B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for Metal Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.
B. Finishes and Colors: Provide manufacturer's standard factory applied finish for type of system indicated.
C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
D. Wire Hangers, Braces, and Ties: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   1. Gage: Provide wire sized so that 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 2.69 mm (0.106") diameter wire.

E. Edge Moldings and Trim:
   1. Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.
   2. Provide column surround trim at round columns.
F. Retention Clips: Armstrong #414 or similar by other acoustical panel manufacturers.

2.4 NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face Capped Double-Web Steel Suspension System: Main and cross-runners roll-formed from pre-painted or electrolytic zinc-coated cold-rolled steel sheet, with pre-finished 15/16" wide metal caps on flanges; other characteristics as follows:
   1. Structural Classification: Intermediate Duty System
   2. End Condition of Cross-Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
   3. Cap Material and Finish: Steel sheet painted white

2.5 MISCELLANEOUS MATERIALS

A. Tile Adhesive as recommended by tile manufacturer, with UL label for Class 0-25 flame spread

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system.
B. Correct all unsatisfactory conditions before proceeding with work.

3.2 PREPARATION

A. Furnish layouts for preset inserts, clips, and other ceiling anchors for installation specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.
   1. Avoid use of less than half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
   1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.
B. Arrange acoustical units in a manner shown by reflected ceiling plans.
   1. In areas of ACT unit installation, provide retention clips in accordance with ceiling panel manufacturer’s recommendations.
C. Suspend ceiling hangers from building structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with the location of hangers at spacing supporting standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   a. Size the supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire tying, either directly to structures or to inserts, eye-screws, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members.
   a. Attach to inserts, eye-screws, or other devices that are secure and appropriate for structure to hanger attachments as well as for type of hanger involved.
   b. In a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 48" on center along each member supported directly from hangers.
   a. In addition, provide hangers not more than 8" from ends of each member.

D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units.
E. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
   1. Scribe and cut panels to fit accurately at borders and at penetrations.

3.4 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members.
B. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
C. Remove and replace work that cannot be successfully cleaned, repair to eliminate evidence of damage.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Exterior paint and coating systems

1.3 RELATED SECTIONS

A. See related sections of the specifications for surface preparation, primers, and finishes provided by others.

1.4 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
B. ASTM D4442-92 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood Base Materials
C. EPA - Method 24
D. GS-11, GC-03
E. LEED for Schools 2009 latest edition by USGBC
F. NACE International (National Association of Corrosion Engineers) - Industrial Maintenance Painting
G. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications
H. Paint - Certified Product List - Florida Department of Agriculture and Consumer Services
I. PDCA (Painting and Decorating Contractors of America) - Architectural Painting Specifications Manual
J. PDCA Standard P1-04 Touchup Painting and Damage Repair; Financial Responsibility
K. PDCA Standard P5-04 Benchmark Sample Procedures for Paint and other Decorative Coating System
L. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual
M. SSPC-SP 1 - Solvent Cleaning

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each paint and coating product shall include:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specifications
   4. Storage and handling requirements
   5. Application methods
   6. Cautions and VOC levels
C. Selection Samples:
   1. Submit a complete set of color chips representing the full range of manufacturer's color samples available.
   2. Submit two 9" x 9" samples illustrating selected colors and textures for each type.

1.7 QUALITY ASSURANCE

A. Pre-Application meeting:
   1. Prior to contractor starting to apply any material covered in this section, there shall be a meeting with the Owner (FS and PM), Architect, Contractor, Subcontractor, and Material Supplier.
   2. Meeting shall discuss mockups, surface condition, surface preparation, material application, and inspection procedures.
      a. Prepare all mockups in accordance with PDCA P5-04.
B. The Contractor shall request the following in progress field inspections and the Owner's representative shall approve each inspection prior to proceeding with the next step.
   1. Following surface preparation and prior to priming
   2. Following priming and prior to applying finish coats
   3. Following application of finish coats
   4. All inspections shall follow FS normal procedure for verifying surface conditions and materials applied.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5-years documented experience.
B. Applicator: Company specializing in performing the work of this section with minimum 5-years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.10 FIELD SAMPLES

A. Provide exterior field sample at an outside corner condition with finish extending minimum 10' both directions and selected height.
B. Locate where directed by Architect and Owner.
C. Accepted sample may remain as part of the work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00, follow manufacturer's requirements.
B. Deliver products to site in manufacturer's unopened containers with the following labeling and information:
    1. Product name and type (description)
    2. Application & use instructions
    3. Surface preparation instructions
    4. VOC content
    5. Environmental issues; i.e. cleanup requirements, disposal requirements, etc
    6. Batch date
    7. Color number and name
C. Storage:
    1. Store paint materials in a properly ventilated area at the temperature range required by the manufacturer.
    2. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with manufacturer's and other regulating authorities having jurisdiction.

1.12 PROJECT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are below 40°F, or below the manufacturer's requirements.
B. Do no exterior work on unprotected surfaces if it is raining or moisture from any source is present or expected before finishes can dry or attain proper cure.
    1. Allow surfaces to dry and attain required temperatures and conditions before proceeding or continuing previously started work.
C. Follow manufacturer's directions for extremes and dew point requirements.
    1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
    2. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.
D. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.
E. Dispose of waste in accordance with applicable regulations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
    1. The painting schedule is based on products manufactured by the Sherwin-Williams Company.
    2. The owner's representative will consider equal products by other manufacturers for approval in accordance with paragraph 1.4.
B. Owner will consider requests for substitutions in accordance with provisions of the specifications.
    1. When submitting a request for substitution, provide complete product data specified above under paragraph 1.4 for each substitute product.

2.2 EXTERIOR PAINTING SCHEDULE

A. Masonry (.CMU, Split-Face, Scored, Smooth, High-Density, Low- Density, Fluted)
   1. Latex Systems
      a. Gloss Finish
         1st Coat: S-W PreRite Blocker Filler, B25W25 (16-mil wet, 8-mil dry)
         2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
         3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4-mil wet, 1.3-mil dry per coat)
      b. Semi-Gloss Finish
         1st Coat: S-W PreRite Blocker Filler, B25W25 (16-mil wet, 8-mil dry)
         2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
         3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4-mil wet, 1.5-mil dry per coat)
      c. Satin Finish
         1st Coat: S-W PrepRite® Block Filler, B25W25 (16-mil wet, 8-mil dry)
         2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
         3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4-mil wet, 1.4-mil dry per coat)
   2. Clear Water Repellant
      a. Clear Finish
         1st Coat: S-W Loxon7% Siloxane Water Repellant, A10T7
         2nd Coat: S-W Loxon7% Siloxane Water Repellant, A10T7 (50-200 sq ft/gal)
   3. Texture Coating System - Contractor shall have option approved by Architect
      a. Spray-on Solvent Borne Textured Masonry Coating
         1st Coat: S-W UltraCrete Solvent Borne Smooth, B46 Series (100-160 sq ft/gal)
         2nd Coat: S-W UltraCrete Solvent Borne Textured, B46 Series (50-80 sq ft/gal)
         Minimum total dry film thickness of 10-16 mils for waterproofing system, Texture and color as selected by Architect
      b. Spray-on 100% Acrylic Textured Masonry Coating
         1st Coat: S-W Loxon® Block Surfacer, A24W300 Series (8 mils)
         2nd Coat: S-W UltraCrete Textured Masonry Topcoat, A44W800 Series (9.4 mils)
         Texture and color as selected by Architect
      c. Tex Cote By Textured Coating of America, inc
         1st Coat: TEX·COTE® COOLWALL® Smooth Classic Primer or TEX·COTE® COOLWALL® Textured Primer
         2nd Coat: TEX·COTE® COOLWALL
B. Metal – (Aluminum, Galvanized)
   1. Latex Systems
      a. Gloss Finish
         1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
         2nd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W611 Series
         3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W611 Series (2.5 - 4.0-mil dry per coat)

b. Semi-Gloss Finish
1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
2nd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W651 Series
3rd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W651 Series (2.5 - 4.0-mil dry per coat)

C. Metal - (Misc Iron, Ornamental Iron, Structural Iron, Ferrous Metal)
1. Latex Systems
a. Gloss Finish
1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (2.0-4.0-mil dry)
2nd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W611 Series
3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W611 Series (2.5 - 4.0-mil dry per coat)
b. Semi-Gloss Finish
1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (2.0 – 4.0-mil dry)
2nd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W651 Series
3rd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W651 Series (2.5 - 4.0-mil dry per coat)

D. Architectural PVC, Plastic, Fiberglass
1. Latex Systems
a. Gloss Finish
1st Coat: S-W PreRite ProBlock Latex Primer, B51 Series (4-mil wet, 1.4-mil dry)
2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4-mil wet, 1.3-mil dry per coat)
b. Semi-Gloss Finish
1st Coat: S-W PreRite ProBlock Latex Primer, B51 Series (4-mil wet, 1.4-mil dry)
2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4-mil wet, 1.5-mil dry per coat)

E. Synthetic Stucco
1. Latex Systems
a. Gloss Finish
1st Coat: S-W A-100 Exterior Latex Primer, B42W41 Series
2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4-mil wet, 1.3-mil dry per coat)
b. Semi-Gloss Finish
1st Coat: S-W A-100 Metalatex Acrylic Semi-Gloss, B42 Series
2nd Coat: S-W -100 Metalatex Acrylic Semi-Gloss, B42 Series (4-mil wet, 1.5-mil dry per coat)
c. Flat Finish
1st Coat: S-W A-100 Exterior Latex Flat, A6 Series
2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4-mil wet, 1.4-mil dry per coat)

2.3 MATERIALS – GENERAL REQUIREMENTS

A. Paints and Coatings - General
   1. Unless otherwise indicated, provide factory-mixed coatings.
   2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless approved in manufacturer's product instructions.
   4. Confirm VOC's need by using the products MSDS sheets.
B. Primers
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.4 ACCESSORIES

A. Coating application accessories:
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.
B. Do not begin application of coatings until substrates have been properly prepared; notify Owner's Representative of unsatisfactory conditions before proceeding.
C. If substrate preparation is the responsibility of another installer, notify Owner's Representative of unsatisfactory preparation before proceeding.
D. Proceed with work only after conditions are corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
E. Test shop applied primer for compatibility with subsequent cover materials.
F. Measure moisture content of surfaces using an electronic moisture meter, DO NOT apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12%
   2. Masonry, Concrete, and Concrete Unit Masonry: 12%
   3. Interior Wood: 15%, measured in accordance with ASTM D2016
   4. Concrete Floors: 8%

3.2 SURFACE PREPARATION

A. The surface shall be dry and in sound condition.
   1. Remove all oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.
B. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
C. Correct defects and clean surfaces that affect work of this section.
   1. Remove existing coatings that exhibit loose surface defects.
D. Seal with shellac any marks, which may bleed through surface finishes.
E. Impervious Surfaces:
   1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.

2. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces Scheduled for Paint Finish:
   1. Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP1 Solvent Cleaning.

G. Block/Unit Masonry (Cinder and Concrete)
   1. Remove all loose mortar and foreign material.
   2. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners.
   3. Let concrete and mortar cure at least 30 days at 75°F unless the manufactures products are designed for application prior to the 30-day period.
   4. The pH of the surface and moisture content must be in accordance with the paint manufacturer's recommendations prior to painting.

H. Stucco and Cement Composition Siding/Panels:
   1. Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly.
      a. Allow the surface to dry thoroughly.
      b. The pH of the surface and moisture content should be in accordance with the paint manufacturer's recommendations prior to painting.

I. Copper Surfaces Scheduled for a Paint Finish:
   1. Remove contamination by steam, high-pressure water, or solvent washing.
   2. Apply vinyl etch primer immediately following cleaning.

J. Copper Surfaces Scheduled for a Natural Oxidized Finish:
   1. Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid.
   2. Rub on repeatedly for required effect.
   3. Once attained, rinse surfaces with clear water and allow to dry.

K. Drywall – Exterior:
   1. Shall be clean, dry and all dust removed prior to painting.
   2. All nail heads must be set and spackled.
   3. Tape all joints and cover with a joint compound.
   4. Spackled nail heads and tape joints shall be sanded smooth.

L. Galvanized Metal Surfaces:
   1. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils.
   2. Apply a test area, priming as required.
   3. Allow the coating to cure in accordance with the manufacturer's recommendation before testing.
   4. Perform adhesion tests in accordance with ASTM 3359 Adhesion by Tape Test.
   5. If adhesion is poor, then notify Owner's representative that additional surface preparation under another section is necessary to remove pre-treatments or contaminants that interfere with adhesion of the coating.

M. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

N. Plaster Surfaces:
   1. Shall allow to thoroughly dry for at least 30 days before painting, unless the manufacturer's products are designed for application prior to the 30-day period.
      a. Bare plaster must be cured and hard prior to painting.
      b. Correct any soft, porous, or powdery plaster per requirements under another section of the specifications.

O. Steel: Structural, Plate, etc:

1. Check other sections for additional surface preparation and shop priming of bare steel surfaces.
2. Surface preparation shall include appropriate SSPC recommended methods.
3. Shop primer shall be compatible with the field-applied coatings.
4. Surfaces shall be dry and clean prior to the application of field-applied coatings.
5. Remove all contaminants in accordance with SSPC-SP1 Solvent Cleaning.

P. Wood:
1. Shall be clean and dry, then prime and paint as soon as possible.
2. Scrape, sand, and spot prime knots and pitch streaks before a full priming coat is applied.
3. Patch all nail holes and imperfections with a wood filler or putty and sand smooth after application of primer.

Q. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION/INSTALLATION

A. Mix, thin, and apply all coatings and products in accordance with manufacturer's instructions.
B. Do not apply coatings to wet or damp surfaces.
1. Wait at least 30 days before applying to new concrete or masonry, or follow manufacturer’s procedures to apply appropriate coatings prior to 30 days.
2. Test new concrete for moisture content.
C. Apply coatings using methods recommended by manufacturer.
D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen to achieve a properly painted surface in accordance with PDCA Standard P1-04.
E. Apply coatings at spreading rate required to achieve the manufacturer’s recommended dry film thickness.
F. The coated surface shall be inspected and accepted by the Owner’s Representative.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Divisions 21, 22, 23, 26, 27, & 28 for schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.
B. Paint shop primed equipment.
C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars, and supports, in finished areas, except where items are pre-finished.
E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces.
1. Paint dampers exposed behind louvers and grilles to match face panels.
F. Paint exposed conduit and electrical equipment occurring in finished areas.
G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
H. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated.
1. Color band and identify with flow arrows, names, and numbering.
I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 TOUCH UP and DAMAGE REPAIR

A. Contractor shall repair all deficiencies in coating application in accordance with PDCA Standard P1-04.
B. Inform Owner's representative of all damage to properly painted surfaces and receive authorization prior to performing damage repair.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Exterior paint and coating systems.

1.3 RELATED SECTIONS

A. See related sections of the specifications for surface preparation, primers, and finishes provided by others.

1.4 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
B. ASTM D4442-92 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood Base Materials
C. EPA - Method 24
D. GS-11, GC-03
E. LEED for Schools 2009 latest edition by USGBC
F. NACE International (National Association of Corrosion Engineers) - Industrial Maintenance Painting
G. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications
H. Paint - Certified Product List - Florida Department of Agriculture and Consumer Services
I. PDCA (Painting and Decorating Contractors of America) - Architectural Painting Specifications Manual
J. PDCA Standard P1-04 Touchup Painting and Damage Repair; Financial Responsibility
K. PDCA Standard P5-04 Benchmark Sample Procedures for Paint and other Decorative Coating System
L. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual
M. SSPC-SP 1 - Solvent Cleaning

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each paint and coating product shall include:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specifications
   4. Storage and handling requirements
   5. Application methods
   6. Cautions and VOC levels
C. Selection Samples:
   1. Submit a complete set of color chips representing the full range of manufacturer's color samples available.
   2. Submit two 9" x 9" samples illustrating selected colors and textures for each type.

1.7 QUALITY ASSURANCE

A. Pre-Application meeting:
   1. Prior to contractor starting to apply any material covered in this section, there shall be a meeting with the Owner (FS and PM), Architect, Contractor, Subcontractor, and Material Supplier.
   2. Meeting shall discuss mockups, surface condition, surface preparation, material application, and inspection procedures.
      a. Prepare all mockups in accordance with PDCA P5-04.
B. The Contractor shall request the following in progress field inspections and the Owner's representative shall approve each inspection prior to proceeding with the next step.
   1. Following surface preparation and prior to priming
   2. Following priming and prior to applying finish coats
   3. Following application of finish coats
   4. All inspections shall follow FS normal procedure for verifying surface conditions and materials applied.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5-years documented experience.
B. Applicator: Company specializing in performing the work of this section with minimum 5-years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.10 FIELD SAMPLES

A. Provide exterior field sample at an outside corner condition with finish extending minimum 10' both directions and selected height.
B. Locate where directed by Architect and Owner.
C. Accepted sample may remain as part of the work.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00, follow manufacturer's requirements.
B. Deliver products to site in manufacturer's unopened containers with the following labeling and information:
    1. Product name and type (description)
    2. Application & use instructions
    3. Surface preparation instructions
    4. VOC content
    5. Environmental issues; i.e. cleanup requirements, disposal requirements, etc
    6. Batch date
    7. Color number and name
C. Storage:
    1. Store paint materials in a properly ventilated area at the temperature range required by the manufacturer.
    2. Store and dispose of solvent-based materials and materials used with solvent-based materials in accordance with manufacturer's and other regulating authorities having jurisdiction.

1.12 PROJECT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are below 40°F, or below the manufacturer's requirements.
B. Do no exterior work on unprotected surfaces if it is raining or moisture from any source is present or expected before finishes can dry or attain proper cure.
    1. Allow surfaces to dry and attain required temperatures and conditions before proceeding or continuing previously started work.
C. Follow manufacturer's directions for extremes and dew point requirements.
    1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
    2. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.
D. Provide lighting level of 80 foot-candles measured mid-height at substrate surface.
E. Dispose of waste in accordance with applicable regulations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
    1. The painting schedule is based on products manufactured by the Sherwin-Williams Company.
    2. The owner's representative will consider equal products by other manufacturers for approval in accordance with paragraph 1.4.
B. Owner will consider requests for substitutions in accordance with provisions of the specifications.
    1. When submitting a request for substitution, provide complete product data specified above under paragraph 1.4 for each substitute product.

2.2 INTERIOR PAINTING SCHEDULE

A. Masonry (.CMU, Split-Face, Scored, Smooth, High-Density, Low- Density, Fluted)
   1. Latex Systems
      a. Gloss Finish
         1st Coat: S-W Loxon® Block Surfacer, A24W200 (16-mil wet, 8-mil dry)
         2nd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic, B66-600 Series
         3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic, B66-600 Series (2.5 - 4-mil dry per coat)
      b. Semi-Gloss Finish
         1st Coat: S-W Loxon® Block Surfacer, A24W200 (16-mil wet, 8-mil dry)
         2nd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic, B66-650 Series
         3rd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic, B66-650 Series (2.5 - 4-mil dry per coat)
      c. Eggshell/Satin Finish
         1st Coat: S-W PrepRite® Block Filler, B25W25 (16-mil wet, 8-mil dry)
         2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
         3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4-mil wet, 1.6-mil dry per coat)
   2. Water Epoxy System (Water Base)
      a. Gloss Finish
         1st Coat: S-W Loxon® Block Surfacer, A24W200 (16-mil wet, 8-mil dry)
         2nd Coat:S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15
         3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (2.5 - 3-mil dry per coat)
      b. Semi-Gloss Finish
         1st Coat: S-W Loxon® Block Surfacer, A24W200 (16-mil wet, 8-mil dry)
         2st Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25
         3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (2.5 - 3-mil dry per coat)

B. Metal – (Aluminum, Galvanized)
   1. Latex Systems
      a. Gloss Finish
         1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
         2nd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W600 Series
         3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W600 Series (2.5 - 4.0-mil dry per coat)
      b. Semi-Gloss Finish
         1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
         2nd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W650 Series
         3rd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W650 Series (2.5 - 4.0-mil dry per coat)

2. Epoxy Systems (Water Base)
    a. Gloss Finish
        1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
        2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15
        3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15 (2.5 - 3.0-mil dry per coat)
    b. Semi-Gloss Finish
        1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
        2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V25
        3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V25 (2.5 - 3.0-mil dry per coat)

C. Metal – (Galvanized; Ceiling, Ductwork)
    1. Dryfall Waterborne Systems
        a. Eggshell Finish
            1st Coat: S-W Waterbased Acrylic Dry-Fall, B42W2
            2nd Coat: S-W Waterbased Acrylic Dry-Fall, B42W2

D. Metal - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Structural Iron, Ferrous Metal)
    1. Latex Systems
        a. Gloss Finish
            1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil wet, 2.0 – 4.0-mil dry)
            2nd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W600 Series
            3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W600 Series (2.5 - 4.0-mil dry per coat)
        b. Semi-Gloss Finish
            1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil wet, 2.0 – 4.0-mil dry)
            2nd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W650 Series
            3rd Coat: S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66W650 Series
        c. Eg-Shel/Satin Finish
            1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil wet, 2.0 – 4.0-mil dry)
            2nd Coat: S-W Pro ProGreen 200 Eg-Shel, B20-650 Series
            3rd Coat: S-W Pro ProGreen 200 Eg-Shel, B20-650 Series (4-mil wet, 1.6-mil dry per coat)
    2. Epoxy Systems (Water Base)
        a. Gloss Finish
            1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
            2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15
            3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15 (2.5 - 3.0-mil dry per coat)

3. Dryfall Waterborne System
    a. Eggshell Finish
        1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5.0 – 10.0-mil dry)
        2nd Coat: S-W Waterbased Acrylic Dry-Fall, B42W2
        3rd Coat: S-W Waterbased Acrylic Dry-Fall, B42W2

E. Wood (Walls, Ceilings, Doors, Trim)
1. Latex Systems
    a. Gloss Finish
        1st Coat: S-W PrepRite® ProBlock® Latex Primer, B51 Series (4-mil wet, 1.4-mil dry)
        2nd Coat: S-W A Pro Industrial Zero VOC Gloss Acrylic B66W600 Series
        3rd Coat: S-W Pro Industrial Zero VOC Gloss Acrylic B66W600 Series (2.5 – 4.0-mil dry per coat)
    b. Semi-Gloss Finish
        1st Coat: S-W PrepRite® ProBlock® Latex Primer, B51 Series (4-mil wet, 1.4-mil dry)
        2nd Coat: S-W A Pro Industrial Zero VOC Semi-Gloss Acrylic B66W650 Series
        3rd Coat: S-W Pro Industrial Zero VOC Gloss Semi-Acrylic B66W650 Series (2.5 – 4.0-mil dry per coat)
    c. Eg-Shel/Satin Finish
        1st Coat: S-W PrepRite® ProBlock® Latex Primer, B51 Series (4-mil wet, 1.4-mil dry)
        2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
        3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4-mil wet, 1.6-mil dry per coat)
2. Stain and Varnish Systems
    a. Gloss Finish
        1st Coat: S-W Minwax 250 VOC Stains
        2nd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series
        3rd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (4.0-mil wet, 1.0-mil dry per coat)
    b. Satin Finish
        1st Coat: S-W Minwax 250 VOC Stains
        2nd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series
        3rd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (4.0-mil wet, 1.0-mil dry per coat)

F. Drywall (Walls, Ceiling, etc)
1. Latex Systems
    a. Semi-Gloss Finish
        1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4-mil wet, 1.3-mil dry)
        2nd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series
        3rd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series (4-mil wet, 1.6-mil dry per coat)

b. Eg-Shel/Satin Finish
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4-mil wet, 1.3-mil dry)
   2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
   3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4-mil wet, 1.6-mil dry per coat)

c. Flat Finish Ceiling Only
   1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4-mil wet, 1.3-mil dry)
   2nd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series
   3rd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series (4-mil wet, 1.6-mil dry per coat)

2. Epoxy System (Water Base)

a. Gloss Finish
   1st Coat: S-W ProGreen 200 Interior Latex Primer, B28W600 (4-mil wet, 1.5-mil dry)
   2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15
   3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V15 (2.5 - 3-mil dry per coat)

b. Semi-Gloss Finish
   1st Coat: S-W ProGreen 200 Interior Latex Primer, B28W600 (4-mil wet, 1.5-mil dry)
   2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V25
   3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211 / B60V25 (2.5 - 3-mil dry per coat)

2.3 MATERIALS – GENERAL REQUIREMENTS

A. Paints and Coatings - General
   1. Unless otherwise indicated, provide factory-mixed coatings.
   2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless approved in manufacturer's product instructions.
   4. Confirm VOC’s need by using the products MSDS sheets.

2.4 ACCESSORIES

A. Coating application accessories:
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.

B. Do not begin application of coatings until substrates have been properly prepared; notify Owner's Representative of unsatisfactory conditions before proceeding.
C. If substrate preparation is the responsibility of another installer, notify Owner's Representative of unsatisfactory preparation before proceeding.
D. Proceed with work only after conditions are corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
E. Test shop applied primer for compatibility with subsequent cover materials.
F. Measure moisture content of surfaces using an electronic moisture meter, DO NOT apply finishes unless moisture content of surfaces are below the following maximums:
    1. Plaster and Gypsum Wallboard: 12%
    2. Masonry, Concrete, and Concrete Unit Masonry: 12%
    3. Interior Wood: 15%, measured in accordance with ASTM D2016
    4. Concrete Floors: 8%

3.2 SURFACE PREPARATION

A. The surface shall be dry and in sound condition.
    1. Remove all oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.
B. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
C. Correct defects and clean surfaces that affect work of this section.
    1. Remove existing coatings that exhibit loose surface defects.
D. Seal with shellac any marks, which may bleed through surface finishes.
E. Impervious Surfaces:
    1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
    2. Rinse with clean water and allow surface to dry.
F. Aluminum Surfaces Scheduled for Paint Finish:
    1. Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP1 Solvent Cleaning.
G. Block/Unit Masonry (Cinder and Concrete)
    1. Remove all loose mortar and foreign material.
    2. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners.
    3. Let concrete and mortar cure at least 30 days at 75°F unless the manufactures products are designed for application prior to the 30-day period.
    4. The pH of the surface and moisture content must be in accordance with the paint manufacturer's recommendations prior to painting.
H. Cement:
    1. Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly.
        a. Allow the surface to dry thoroughly.
        b. The pH of the surface and moisture content should be in accordance with the paint manufacturer's recommendations prior to painting.
I. Drywall – Interior:
    1. Shall be clean, dry and all dust removed prior to painting.
    2. All nail heads must be set and spackled.
    3. Tape all joints and cover with a joint compound.
    4. Spackled nail heads and tape joints shall be sanded smooth.
J. Galvanized Surfaces:

1. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils.
2. Apply a test area, priming as required.
3. Allow the coating to cure in accordance with the manufacturer's recommendation before testing.
4. Perform adhesion tests in accordance with ASTM 3359 Adhesion by Tape Test.
5. If adhesion is poor, then notify Owner's representative that additional surface preparation under another section is necessary to remove pre-treatments or contaminants that interfere with adhesion of the coating.

K. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
L. Plaster Surfaces:
   1. Shall allow to thoroughly dry for at least 30 days before painting, unless the manufacturer's products are designed for application prior to the 30-day period.
      a. Bare plaster must be cured and hard prior to painting.
      b. Correct any soft, porous, or powdery plaster per requirements under another section of the specifications.
M. Steel: Structural, Plate, etc:
   1. Check other sections for additional surface preparation and shop priming of bare steel surfaces.
   2. Surface preparation shall include appropriate SSPC recommended methods.
   3. Shop primer shall be compatible with the field-applied coatings.
   4. Surfaces shall be dry and clean prior to the application of field-applied coatings.
   5. Remove all contaminants in accordance with SSPC-SP1 Solvent Cleaning.
N. Wood:
   1. Shall be clean and dry, then prime and paint as soon as possible.
   2. Scrape, sand, and spot prime knots and pitch streaks before a full priming coat is applied.
   3. Patch all nail holes and imperfections with a wood filler or putty and sand smooth after application of primer.
O. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION/INSTALLATION

A. Mix, thin, and apply all coatings and products in accordance with manufacturer's instructions.
B. Do not apply coatings to wet or damp surfaces.
   1. Wait at least 30 days before applying to new concrete or masonry, or follow manufacturer's procedures to apply appropriate coatings prior to 30 days.
   2. Test new concrete for moisture content.
C. Apply coatings using methods recommended by manufacturer.
D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen to achieve a properly painted surface in accordance with PDCA Standard P1-04.
E. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
F. The coated surface shall be inspected and accepted by the Owner's Representative.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Divisions 21, 22, 23, 26, 27, & 28 for schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.
B. Paint shop primed equipment.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars, and supports, in finished areas, except where items are pre-finished.
E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces.
    1. Paint dampers exposed behind louvers and grilles to match face panels.
F. Paint exposed conduit and electrical equipment occurring in finished areas.
G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
H. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated.
    1. Color band and identify with flow arrows, names, and numbering.
I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 TOUCH UP and DAMAGE REPAIR

A. Contractor shall repair all deficiencies in coating application in accordance with PDCA Standard P1-04.
B. Inform Owner's representative of all damage to properly painted surfaces and receive authorization prior to performing damage repair.

END OF SECTION

DIVISION 10 SPECIALTIES

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Tactile/raised letter plastic signs
   2. Individual plastic characters signs
   3. Signs of silk-screened characters on plastic
   4. Cast signs

1.3 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People
B. FBC - Florida Building Code, Chapter 11 and Section 423.14.2
C. NFPA 101: 7.10.1.3

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.
B. Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign and anchorage.
C. Provide complete interior and exterior sign schedule showing sign type, location, and verbiage.
D. Samples: Submit two sample signs in size illustrating type, style, letter font, and colors specified, and method of attachment.
E. Provide manufacturer's installation instructions, templates, and attached devices.
F. Colors shall be as selected by the Architect.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable codes for requirements for the physically handicapped, safety and egress.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01 60 00.
B. Package signs, labeled in name groups.
C. Store adhesive attachment tape at ambient room temperatures.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.
B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 FLORIDA AMERICANS WITH DISABILITIES ACT REQUIREMENTS

A. Manufacturer shall conform to tactile, Braille, letter size, and other requirements as required by Florida Accessibility Code for Building Construction and ANSI A117.1.
B. ADA requirements supersede technical specifications in this Section.

2.2 MANUFACTURER

A. Identifying devices shall be as manufactured by Andco Industries Corp., or approved equal.
B. Products of the following manufacturers are acceptable providing their products equal or exceed the quality specified; and they can provide signs of the type, size, finish, letter style, and arrangement required.
    1. ASI Sign Systems, Indianapolis, Indiana
    2. Best Mfg., Montrose, Colorado
    3. Baron Sign Company, Lake Park, Florida
    4. Liberty Sign, Jupiter, Florida

2.3 BUILDING SIGNAGE - GENERAL

A. General; applies to all signs except as noted:
    1. Material shall be minimum 1/8" clear matte acrylic stock with 3/8" radius corners.
        a. Exterior signs – Shall be UV stable material of non-petroleum base phenolic resin using sand carving process to create the raised lettering, which is an integral part of the sign.
        b. Interior signs – Shall be material of non-petroleum base phenolic resin using sand carving process to create the raised lettering, which is an integral part of the sign.
        c. Interior signs exposed to direct sun, shall be of same material as exterior signs.
        d. Paint shall be Matthews Acrylic Polyurethane system or equal.
            i) Shall be low VOC
            ii) Shall be UV Stable
            iii) Shall be lead and chromate free
            iv) Minimum life expectancy of 10-years
    2. Applied lettering not allowed.
    3. Letters and background colors selected by Architect from manufacturer's standard colors
    4. Mounting:
        a. Shall be with adhesives and non-removable oval head screws
        b. Mount at locations as directed by Architect

c. Mount at 60" above finished floor to the center of the sign

5. Graphic Process with Braille in one of the following, but no applied lettering method allowed:
   a. Provide raised (photopolymer process)
   b. Engraved letters
   c. Sand craved process
6. Letters:
   a. Letters and numbers shall have width to height ratio between 3:5 and 1:1 and stroke width to height ratio between 1:5 and 1:10.
   b. Letters and numbers to be raised $^{1}/_{32}$" upper case sans serif font with Grade 2 Braille
   c. Raised characters shall be 5/8" high minimum and 2" high maximum.
   d. Pictograms shall have the equivalent verbal description directly below the pictogram.
7. Characters and backgrounds must be matte or other non-glaze surface and of contrasting colors.
8. All signs shall comply with Chapter 11 FBC.

B. Capacity signs:
1. For all rooms with a capacity of 50 persons or more as shown on the drawings or other rooms as indicated on the plans.
2. Furnish and install signage, 3" high by length required, reading "MAXIMUM CAPACITY".
3. Allow for 3-digits maximum after "maximum capacity", copy as shown on the drawings.

C. Toilet Room Handicapped Signs
1. Furnish and install one sign depicting National Handicapped Symbol (wheelchair) at each toilet room, equipped with facilities for the handicapped.
   a. Size shall be 6" by 6".

D. Room Name and Number Signs
1. Provide a sign for each room or space to include name and room number.
   a. Classroom and administrative office signs shall have a slot providing the owner the ability to add a teacher's name and change the name as necessary.
   b. Minimum size of 3" high by 6" wide for signs, longer where nomenclature demands
2. Mount number as directed by Architect.
3. All spaces listed in Finish Schedule plus if more than one door is to a space, additional signs will be required one by number of doors to space.

E. Storage Signs
1. Provide and install at mechanical and electrical rooms a sign mounted on the door to read as follows: " STORAGE NOT ALLOWED"
2. Signs shall be matte acrylic plastic, red background with white letters 3 " high by width needed for copy and Braille, with 3/8" radius corners.
3. Mount on doors with non-removable oval head screws verify number signs required.

F. Fire Extinguisher, No Exit and Pull Station Sign
1. Copy to read: “No Exit”, "Fire Pull Station Inside", And "Fire Extinguisher Inside"
2. Red letters, same material, size and mounting as in A. General.
3. NO EXIT sign shall have letter size as per NFPA 101 section 7.10.8.3.
4. Braille sign not required for fire extinguisher.
5. See plans for locations.

G. Evacuation Plan
1. Provide four frames for a graphic floor plan in each student occupied room.
   a. Size to be nominal 9" high by 12" width
   b. Provide a clear removable plastic cover over each sign.
   c. Sign cover will only be removable using a tool.

2. Mounting:
    a. Non-removable oval head screws, using rawl plugs where mounted on masonry.
    b. Architect shall supply the plans to the Contractor.
3. Frame Material: Matte acrylic plastic with all edges eased and tempered glass or clear plastic cover.

H. Fire Rated/Smoke Partition Labeling
1. Field label all fire rated walls above ceiling level, with fire rating shown on the construction plans.
    a. Provide minimum 1½" high block lettering stenciled on wall above finished ceiling, if in a storage, mechanical, electrical, or similar unfinished room, install at approximately 84 inches above floor.
    b. *(Contractor to use rating from permit plans)* HOUR FIRE RATED WALL, PROTECT ALL OPENING AND THROUGH WALL PENETRATION PER CODE REQUIREMENTS.
2. Field label all smoke partitions above ceiling level.
    a. Provide minimum 1½" high block lettering stenciled on wall above finished ceiling, if storage, mechanical, electrical, or unfinished room, install at 84" above floor.
    b. SMOKE PARTITION, PROTECT ALL OPENING AND THROUGH WALL PENETRATION PER CODE REQUIREMENTS.

I. Mechanical, Electrical, Data, and Similar Rooms
1. Provide a sign saying "NO STORAGE" meeting the General requirements.
2. If these rooms have pair of doors, provide sign saying "THIS DOOR TO REMAIN CLOSED AND LATCHED TOP AND BOTTOM, EXCEPT DURING THE TRANSFER OF EQUIPMENT".
    a. Sign shall have 1" high block letters and be permanently attached (Attached in way as to maintain the rating of the door) to the inactive door near the latch side 60 inches from finished floor to center of sign.
    b. Braille not required for this sign.

J. Mounting:
1. When not specifically indicated mount with non-removable oval head screws and adhesive.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all signs in strict accordance with manufacturer's instructions and FADA requirements.
B. Room signs to be mounted 60" to center above finish floor on walls adjacent to the latch side of any door opening.

3.2 CLEANING

A. After installation, thoroughly clean all exposed surfaces and restore all damaged material to its original condition or replaced with new material.

3.3 WARRANTY

A. This Contractor shall fully guarantee all materials and labor under this section for a period of 5-years from date of final acceptance of the building against all defects in both workmanship and materials and he shall promptly correct and/or replace such faulty work if so notified.

END OF SECTION

SECTION 10 26 00
DOOR AND WALL PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. This section includes the following types of wall protection systems:
      a. Corner Guards

1.3 REFERENCES

A. FBC - Florida Building Code
B. American Society for Testing and Materials (ASTM)
C. Underwriters Laboratories (UL)

1.4 SUBMITTALS

A. General: Submit the following in accordance with conditions of contract and Division 1 specification Section 01 33 00.
B. Product data and detailed specifications for each system component and installation accessory required, including installation methods for each type of substrate.
C. Provide shop drawings showing locations, extent and installation details of handrails, bumper guards, corner guards, and other protection systems.
   1. Show methods of attachment to adjoining construction.
D. Submit the following samples, as proposed for this work, for verification of color, texture, pattern and end cap attachment/alignment:
   1. One, 12" long sample of each model specified including end cap and mounting hardware.
E. Product test reports from a qualified independent testing laboratory showing compliance of each component with requirements indicated.
F. Maintenance data for wall protection system components for inclusion in the operating and maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Installer qualifications: Engage an installer who has not less than 3-years experience in installation of systems similar in complexity to those required for this project.
B. Manufacturer’s qualifications: Shall be not less than 5-years experience in the production of specified products and a record of successful in-service performance.
C. Code compliance: Assemblies shall conform to all applicable and referenced codes.

D. Fire performance characteristics: Provide wall protection system components with a UL label indicating that they are identical to those tested in accordance with ASTM- E84-91A for Class 1 characteristics listed below:
   1. Flame spread 25 or less
   2. Smoke developed: 450 or less
E. Impact Strength: Provide assembled wall protection units tested in accordance with the applicable provisions of ASTM F476 76 and FBC 1608.
F. Color match, unless otherwise indicated, provide wall protection components that are color matched in accordance with the following:
   1. A delta-E difference of no greater than 1.0, using the Hunter (Lab) Scale.
G. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture, and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.
B. Store the materials in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements.
   1. Maintain a minimum room temperature of 40° F and max of 100° F.

1.7 PROJECT CONDITIONS

A. Environmental requirements: Installation areas must be enclosed and weatherproof before installation commences.
B. Maintain ambient temperature above 65° F during, and for 24 hours after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide drawings and specifications based on manufacturer’s Acrovyn literature from Construction Specialties Inc. unless otherwise indicated.
B. Other manufacturer’s products complying with the minimum levels of material and detailing indicated on the drawings and specified herein shall be acceptable.

2.2 MATERIALS

A. Vinyl/Acrylic:
   1. Extruded material shall be high impact with pebblette grain texture and thickness as indicated on plans.
   2. Chemical and stain resistance shall be per ASTM D-1308 standards.
   3. Colors are as indicated in the finish schedule from manufacturer's standard color range.
B. Aluminum: Extruded aluminum retainers should be 6063-T6 alloy of thickness indicated, with a minimum strength and durability properties as specified in ASTM B221.
C. Fasteners:
   1. Provide non-corrosive fasteners compatible with aluminum retainers.
   2. Manufacturer shall supply all necessary fasteners.

2.3 CORNER GUARDS

A. Surface-mounted corner guards.
   1. Surface-mounted guards consisting of continuous aluminum retainer (optional PVC where indicated) with snap-on cover.
   2. Provide color matched end caps for both partial and full height applications.
   3. Attachment hardware shall be appropriate for wall construction.

2.4 ACCESSORIES

A. Fasteners: Size-mounting hardware for required load and substrate conditions.

2.5 FABRICATION

A. General: Fabricate wall protection systems to comply with requirements indicated for design, dimensions, detail, finish, and member sizes.
B. Preassemble components in the shop to the greatest extent possible to minimize field assembly.
C. Fabricate components with tight seams and joints with exposed edges rolled.
   1. Provide surfaces free of chipping, dents, and other imperfections.

2.6 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applications and designations of finishes.
B. Aluminum mill finish: AA-MIO
C. Wood Finish: AWI 60-degree gloss per ASTM D523

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of conditions:
   1. Examine areas and conditions of work area and identify conditions detrimental to proper or timely completion.
   2. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer’s instructions.
B. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer’s installation instructions.

3.3 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer’s recommendations, using only approved mounting hardware, and locating all components firmly into position, level, and plumb.
B. Adjust installed end caps as necessary to ensure tight seams.

C. Where splices occur in horizontal runs of over 20-feet, provide splice aluminum retainer and vinyl cover at different locations along the run.

3.4 CLEANING

A. General: Immediately upon completion of installation, clean vinyl covers and accessories in accordance with manufacturer's recommended cleaning method.
B. Remove surplus materials, rubbish, and debris resulting from installation as work progresses and upon completion of work.

3.5 PROTECTION

A. Protect installed materials to prevent damage by other trades.
B. Use easily removable materials that do not leaving residue or permanent stains.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Toilet, bath, shower, and washroom accessories
   2. Grab bars
   3. Attachment hardware

1.3 REFERENCES

A. Florida Building Code, Chapter 11 - Florida Accessibility Code for Building Construction
B. ANSI A117.1 - Safety Standards for the Handicapped
C. ADA Accessibility Guidelines for Buildings and Facilities - July 23, 2004 – Provisions for Children
D. ASTM A123 /A123M-02 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
E. ASTM A167-99 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
F. ASTM A269-02 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service
G. ASTM A794-97 Standard Specifications for Commercial Steel, Carbon, Cold-Rolled
H. ASTM B456-95 - Electro-deposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Provide data on accessories describing size, finish, details of function and attachment methods.
C. Samples: Submit a sample of each component illustrating color and finish.
D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on product data.

1.6 COORDINATION

A. Coordinate work under provisions of Section 01 31 00.
B. Coordinate work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

C. Coordinate placement of toilet accessories with accessibility standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A794
B. Stainless Steel Sheet: ASTM A167, Type 304
C. Tubing: ASTM A269, stainless steel
D. Adhesive: Two-component epoxy type, waterproof
E. Fasteners, Screws, and Bolts: Hot dip galvanized tamper-proof and security type.
F. Expansion Shields: Provide fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.
G. Stainless Steel Mirror Surfaces, Where Noted: Not less than 0.04 inch (20 gauge) AISI Type 302/304 stainless steel sheet, stretcher leveled with No. 8 polished mirror finish. Bond to ¼ inch minimum hardboard backing.
H. Mirror Glass: Nominal 6.0mm (0.23 inch) thick, conforming to ASTM C1036, Type I, Class 1, Quality q2, and with silvering electro-plated copper coating, and protective organic coating.
   1. Provide tempered glass, where indicated.

2.2 MANUFACTURERS

A. The products of Bobrick Washroom Equipment are base of design unless noted otherwise.
B. Equal products by other manufactures:
   1. AJ Washroom Accessories
   2. Bradley Corporation
   3. Georgia Pacific
   4. Other Architect/Owner approved equals.

2.3 FABRICATION

A. Weld and grind joints of fabricated components, smooth.
B. Form exposed surfaces from single sheet of stock, free of joints.
   1. Form surfaces flat without distortion.
   2. Maintain flat surfaces without scratches or dents.
C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges.
   1. Form bar with 1½" clearance from wall surface.
   2. Knurl grip surfaces.
D. Shop assembled components and package complete with anchors and fittings.
E. Provide steel anchor plates, adapters, and anchor components for installation.

2.4 KEYING

A. Supply four keys for each accessory to Owner.
B. Provide a master-key system for all accessories.

2.5 FINISHES

A. Galvanizing ASTM A123 to 1.25-oz/sq. yd. Galvanize ferrous metal and fastening devices.
B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.

C. Enamel: Pre-treat to clean condition, apply one-coat primer and minimum two-coat epoxy baked enamel.
D. Chrome/Nickel Plating: ASTM B456, Type SC 2 satin finish.
E. Stainless Steel: No. 4 satin luster finish.
F. Back paint components where in contact with building finishes helping resist electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify site conditions under provisions of Section 01 31 00.
B Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.
C Verify exact location of accessories for installation.
D If accessory locations conflict because of site conditions, notify contractor and architect for clarification.

3.2 REPARATION

A Deliver inserts and rough-in frames to site for timely installation.
B Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A Install accessories in accordance with manufacturer's instructions and Florida Accessibility Code for Building Construction.
B Install plumb and level, securely and rigidly anchored to substrate.

3.4 SCHEDULE

A The following schedule is based on products manufactured by Bobrick except as otherwise indicated.
B Equal products by companies listed in 2.2 B. of this section whose products meet or exceed these specifications are acceptable.
C Refer to symbols on drawings.

SYMBOL	CATALOG NO.	DESCRIPTION
RH		Toilet paper dispenser. To be provided by the Owner and installed by the Contractor.
MH	B-223	Surface mounted stainless steel mop holder (Provide at each Custodial Closet) 36" long unless otherwise noted.
SD-1		Wall mounted liquid soap dispenser. To be provided by the Owner and installed by the Contractor.
TW		Surface mounted roll paper towel dispenser. To be provided by the Owner and installed by the Contractor.
ND	B-254	Surface mounted feminine napkin disposal
MST	B-2906	Stainless steel mirror 18” x 30”
GB1	B-6806.99x36	1½" diameter peened grip horizontal grab bar with concealed mounting; stainless steel

GB2	B-6806.99x42	1½" diameter peened grip horizontal grab bar with concealed mounting; stainless steel

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALITIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under Division 1, General Requirements, are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Fire extinguishers
   2. Fire blankets
   3. Cabinets
   4. Accessories

1.3 QUALITY ASSURANCE

A. Conform to NFPA 10 requirements for all portable fire extinguishers and fire blankets.
B. Use skilled workers thoroughly trained and experienced in the crafts and are familiar with the specifications and the methods needed for proper performance of the work in this section.
C. Provide fire extinguishers, cabinets, fire blankets, and accessories by single manufacturer.
   1. The identification of the listing and labeling organization, the fire test, and the performance standard that the fire extinguisher meets or exceeds shall be clearly marked on each fire extinguisher.

1.4 REFERENCES

A. Carbon Dioxide Types UL 154
B. Dry Chemical Types UL 299
C. Water Types UL 626
D. Halon Types UL 1093
E. UL 92-Fire Extinguisher & Booster Hose
F. UL 711 - Rating and Fire Testing of Fire Extinguishers
G. NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems
   1. Portable fire extinguishers used to comply with this standard shall be listed and labeled and meet or exceed all the requirements of Fire Test Standards UL 711
H. FBC - Florida Building Code
I. FFPC - Florida Fire Prevention Code

1.5 SUBMITTALS

A. Submittals for review
   1. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounting measurements, and locations.
      a. Dimension drawings to depict the space required for these items, and their interface

with the work of other trades.

2. Product Data:
   a. Provide extinguisher operational features, color, and finish, anchorage details.
   b. Manufacturer's brochure, specifications, and other data needed to prove compliance with the specified requirements.
   c. Manufacturers recommended installation procedures, which will become the basis for accepting or rejecting actual installation procedures used on the Work.
   d. Manufacturer's Installation Instructions: Indicate special criteria and any wall opening coordination requirements.

B. Submittals at project closeout
   1. Maintenance Data: Include test, refill, or recharge schedules and re-certification requirements.

1.6 REGULATORY REQUIREMENTS

A. Conform to referenced code for requirements for extinguishers, fire blankets, and cabinets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers shall be considered, providing their product equals or exceeds the quality specified; and they can provide products of the type, size, function, and arrangement required:
   1. Larsen's Manufacturing Co. http://www.larsensmfg.com
   2. Potter Roemer http://www.potterroemer.com
   3. J.L. Industries, Inc. http://www.jlindustries.com

B. Other manufacturer's product may be considered.
   1. The “Substitution Request Form” and complete technical data for evaluation must accompany requests for Architect’s approval.
   2. All materials for evaluation must be received at least 10 days prior to bid due date.

2.2 EXTINGUISHERS

A. Multi-purpose Dry Chemical Type: UL 299, Enameled steel tank with pressure gauge size and classification as scheduled, or if not scheduled, provide 2A-10BC units.
B. Water Type: UL 626, Stainless steel tank pressurized, including hose and nozzle, size and classification as scheduled, or if not scheduled, provide 2A units.
C. Wet Chemical Foam Type: UL 299, designed to meet K class listing, Stainless steel tank with pressure gage; size and classification as scheduled. K class extinguishers shall be used in the food prep services areas with a maximum travel distance of 30'-0" to an extinguisher from within the food prep services areas.
D. Carbon Dioxide Type: UL 154, Stainless steel tank with pressure gage size and classification as scheduled, or if not scheduled, provide 10-BC units.
E. Halogenated Type: UL 1093, Halotron 1, Stainless steel tank with pressure gage; size and classification as scheduled, or if not scheduled, provide 10BC units.
F. Extinguisher Finish:
   1. Multi-purpose units: Provide heavy-duty, DOT steel cylinders with corrosion and impact resistant polyester/epoxy paint finish.
   2. Gaseous and wet chemical units: Provide stainless steel, satin chrome finish.

2.3 EXTINGUISHER CABINETS

A. Metal: Formed sheet steel, galvanized; 18- gage thick base metal. Configuration: Recessed or semi-recessed type, per drawing details and locations, sized to accommodate required extinguishers or combination fire extinguisher and fire blanket cabinet and accessories as indicated.
B. Trim Type: flush for recessed cabinets, rounded corners for semi-recessed or surface mounted unit.
C. Door: 18-gauge thick, reinforced for flatness and rigidity; latch with full glass access.
D. Door Glazing: Plastic, clear, 1/8" thick acrylic.
E. Cabinet Mounting Hardware: Appropriate to cabinet and extinguisher size and weight.
F. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
G. Pre-drill for anchors and accessories.
H. Hinge doors for 180° opening with continuous piano hinge. Provide nylon catch.
I. Weld, fill and grind components smooth.
J. Glaze doors with resilient channel gasket glazing.
K. Finishing Cabinet Exterior Trim and Door: Satin chrome finish with red, silk-screened verbiage “FIRE EXTINGUISHER”.
L. Finishing Cabinet Interior: White enamel

2.4 ACCESSORIES

A. Fire Blanket: Fire retardant treated wool red color 62 x 84 inch size.
B. Extinguisher Brackets: Formed steel chromed finish.
C. Use silk-screened graphic identification.

PART 3 EXECUTION

3.1 INSPECTION:

A. Verify all rough openings, dimensions and clearances are the correct size and in the correct location prior to installation.
B. Examine the areas and conditions of the work in this Section.
    1. Correct conditions detrimental to timely and proper completion of the Work.
    2. Do not proceed until unsatisfactory conditions are correct.
C. Verify servicing, charging and tagging of all fire extinguishers.

3.2 INSTALLATION

A. Provide occupancy hazard protection with fire extinguishers suitable for such Class A, B, C, D, or K fire potentials as might be present and shown on the drawings and schedules.
B. On each floor level, install fire extinguishers in accordance with NFPA 10.
C. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
D. Install cabinets plumb and level in wall openings in strict accordance with NFPA 10, the original design, the approved Shop Drawings and the manufacturer's recommended installation procedures as approved by the Architect and authorizing agencies, anchoring all components firmly into position for long life under hard use.
    1. Secure rigidly in place.

E. Do not install extinguishers until Substantial Completion inspection date.
   1. Place extinguishers and accessories in cabinets or on wall brackets.
F. Inspection tags shall be current as of the date of Substantial Completion and good for 1-year.

END OF SECTION

DIVISION 21

FIRE SUPPRESSION

SECTION 21 10 00

FIRE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this section.

B. The requirements of the following Division-23 Sections applyto this Section:

1. Basic Mechanical Requirements.
2. Basic Mechanical Materials and Methods.
3. Supports and Anchors.
4. Mechanical Identification.

1.02 SUMMARY

A. This Section specifies automatic sprinkler systems for buildings and structures. Materials and equipment specified in this Section include:

1. Pipe, fittings, valves, and specialties.
2. Sprinklers and accessories.

B. Products furnished but not installed include sprinkler head cabinet with spare sprinkler heads. Furnish to the Owner's maintenance personnel.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division-23 Section "Mechanical Identification" for labeling and identification of fire protection piping system and components.

1.03

A. Drawings indicate design intent, coverage, general location of heads, suggested pipe layouts, and additional components. Contractor shall produce a complete set of drawings based on hydraulic calculations which reflect the actual run of pipes dictated by coordination with other disciplines. Pipe sizes to be based on hydraulic calculations.

1.04 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Other definitions for fire protection systems are listed in NFPA Standards 13, 14, 20 and 24.

1.05 SUBMITTALS

A. Product Data for each type sprinkler head, valve, piping specialty, fire protection specialty, and fire department connection, specified.

B. Shop Drawings prepared in accordance with NFPA 13 identified as "Working Plans", including hydraulic calculations, signed and sealed by preparer, and which have been approved by the authority having jurisdiction.

C. Maintenance Data for each type sprinkler head, valve, piping specialty, fire protection specialty, fire department connection, hose and rack, and hose cabinet specified, for inclusion in operating and maintenance manual and Division-23 Section “Basic Mechanical Requirements”.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.

B. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3.

C. Regulatory Requirements: Comply with the requirements of the following codes:

1. NFPA 13 – Standard for the Installation of Sprinkler Systems.
2. NFPA 14 – Standard for the Installation of Standpipe and Hose Systems.
3. NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection
4. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

1.07 SEQUENCING, SCHEDULING, AND COORDINATION

A. Schedule rough-in installations with installations of other building components.

B. Provide double swing connections at each appropriate sprinkler head to allow centering of head in ceiling tile.

1.08 EXTRA MATERIALS

A. Valve Wrenches: Furnish to Owner, 2 valve wrenches for each type of sprinkler head installed.

B. Sprinkler Heads and Cabinets: Furnish six extra sprinkler heads of each style included in the project. Furnish each style with its own sprinkler head cabinet and special wrenches as specified in this Section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide fire protection system products from one of the following:

1. Gate Valves:

   a. Fairbanks
   b. Jenkins
   c. Kennedy Valve, Div of ITT Grinnell Valve Co., Inc.
   d. Stockham

2. Grooved Mechanical Couplings:

   a. Stockham
   b. Victaulic Company of America

3. Water Flow Indicators:

   a. Reliable Automatic Sprinkler Co., Inc.
   b. Victaulic Company of America
   c. Viking Corp.

4. Sprinkler Heads:

   a. Guardian Automatic Sprinkler Co., Inc.
   b. TYCO
   c. Reliable Automatic Sprinkler Co., Inc.
   d. Viking Corp.

2.02 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.

B. Steel Pipe: The sprinkler piping mains shall be fabricated of Schedule 10, ASTM A 795, grooved ends. Branch piping up to 2” shall be ASTM A 135, threadable galvanized steel piping with screwed ends.

2.03 FITTINGS

A. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 300, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

C. Grooved Mechanical Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.

D. Grooved Mechanical Couplings: consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings.

2.04 JOINING MATERIALS

A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Gasket Materials: Thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures.

2.05 GENERAL DUTY VALVES

A. Gate Valves - 2 Inches and Smaller: Body and bonnet of cast bronze, 175 pound cold water working pressure - non-shock, threaded ends, solid wedge, outside screw and yoke, rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being re-packed under pressure, with valve wide open.

B. Gate Valves - 2-1/2 Inches and Larger: Iron body; bronze mounted, 175 pound cold water working pressure - non-shock. Valves shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being re-packed under pressure, with valve wide open.

2.06 AUTOMATIC SPRINKLERS

A. Sprinkler Heads: fusible link type, and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 1/2 inch discharge orifice, for "Ordinary" temperature range.

B. Sprinkler Head Finishes: Provide heads with the following finishes:

1. Upright, Pendant, and Sidewall Styles: chrome plated in finish spaces, exposed to view; rough bronze finish for heads in unfinished spaces and not exposed to view.
2. Concealed Style: rough brass, with painted cover plate.

3. Factory applied corrosion-resistant finish for all locations exposed to weather.

C. Sprinkler Head Cabinet and Wrench: finished steel cabinet, suitable for wall mounting, with hinged cover and space for 6 to 24 spare sprinkler heads plus sprinkler head wrench. Provide a separate cabinet for each style sprinkler head on the project.

1. Stock of spare sprinklers, for each style, shall be as follows:

a. 6 heads for up to 300 installed.
b. 12 heads for 300 to 1000 installed.
c. 24 heads for over 1000 installed.

2.07 ALARM DEVICES

A. General: Types and sizes shall mate and match piping and equipment connections.

B. Water Flow Indicators: vane type water flow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover which sends a signal when cover is removed.

C. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position.

PART 3 EXECUTION

3.01 PIPE APPLICATIONS

A. Install Schedule 40 steel pipe with threaded joints and fittings for 2 inches and smaller.

B. Install Schedule 10 steel pipe with roll-grooved ends and grooved mechanical couplings for sizes 2-1/2 inches and larger.

3.02 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.

B. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

C. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

E. Install flanges or flange adaptors on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

F. Hangers and Supports: Comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake in accordance with NFPA 13.

G. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

3.03 PIPE JOINT CONSTRUCTION

A. Welded Joints: AWS D10.9, Level AR-3.

B. Threaded Joints: conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
2. Align threads at point of assembly.
3. Apply appropriate tape or thread compound to the external pipe threads.
4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
5. Damaged Threads: Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

C. Mechanical Grooved Joints: cut or roll grooves on pipe ends dimensionally compatible with the couplings.

D. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.04 VALVE INSTALLATIONS

A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and 14, and the authority having jurisdiction.

3.05 SPRINKLER HEAD INSTALLATIONS

A. Use proper tools to prevent damage during installations.

3.06 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.

B. Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

3.07 CLOSE-OUT CERTIFICATION

Contractor to submit at substantial completion, a certificate that the entire fire protection system was installed in accordance with NFPA requirements. Certificate to include test results, materials list, and any other pertinent information required by the authority havingjurisdiction.

END OF SECTION

DIVISION 22

PLUMBING

SECTION 22 0517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.
   3. Grout.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.02 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Advance Products & Systems, Inc.
   2. CALPICO, Inc.
   3. Metraflex Company (The).
   4. Pipeline Seal and Insulator, Inc.
   5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Plastic.
   3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.03 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
   2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Div 07.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.03 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
      a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves.
      b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel wall sleeves.
   2. Exterior Concrete Walls below Grade:
      a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
      b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
   3. Concrete Slabs-on-Grade:
      a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between

piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
    1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:
    a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.
5. Interior Partitions:
    a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
    b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

SECTION 22 0518

ESCUTCHEONS FOR PLUMBING PIPING

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.02 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
      f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
      g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
      h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
      i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
      j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.
      k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. New Piping: One-piece, floor-plate type.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

C E

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Bronze swing check valves.
   4. Bronze gate valves.
   5. Iron gate valves.
   6. Bronze globe valves.

B. Related Sections:
   1. Section 22 0553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
   2. Section 22 1116 "Domestic Water Piping" for valves applicable only to this piping.
   3. Section 22 1319 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.
   4. Section 22 1423 "Storm Drainage Piping Specialties" for valves applicable only to this piping.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.03 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
   1. Gate Valves: With rising stem.
   2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: With extended neck.

E. Valve-End Connections:
   1. Flanged: With flanges according to ASME B16.1 for iron valves.
   2. Solder Joint: With sockets according to ASME B16.18.
   3. Threaded: With threads according to ASME B1.20.1.

2.02 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

203 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

204 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Crane Co.; Crane Valve Group; Jenkins Valves.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Zy-Tech Global Industries, Inc.
2. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.

f. Disc: Bronze.

2.05 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Crane Co.; Crane Valve Group; Jenkins Valves.
      b. Hammond Valve.
      c. NIBCO INC.
   2. Description:
      a. Standard: MSS SP-80, Type 2.
      b. CWP Rating: 200 psig (1380 kPa).
      c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
      d. Ends: Threaded or solder joint.
      e. Stem: Bronze.
      f. Disc: Solid wedge; bronze.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.02 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.03 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball, butterfly, or gate valves.
   2. Throttling Service: ball, or butterfly valves.
   3. Pump-Discharge Check Valves:
      a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
      b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.04 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 125, bronze disc.

3. Ball Valves: One piece, full, brass trim.
4. Bronze Swing Check Valves: , bronze disc.
5. Bronze Gate Valves: Class 125, NRS.
6. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:
1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to NPS 100): May be provided with threaded ends instead of flanged ends.
2. Iron Swing Check Valves: Class 125, metal seats.
3. Iron Gate Valves: Class 125, OS&Y.
4. Iron Globe Valves: Class 125.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Fastener systems.
   4. Pipe positioning systems.
   5. Equipment supports.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
   1. Trapeze pipe hangers.
   2. Equipment supports.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.05 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized.

B. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.04 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.05 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
      b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
      c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
      d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
      e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
   5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
   6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.05 PAINTING

A. 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.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Div 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
   4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb (340 kg).
   b. Medium (MSS Type 32): 1500 lb (680 kg).
   c. Heavy (MSS Type 33): 3000 lb (1360 kg).
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

S
E

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.

1.02 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
   2. Letter Color: White.
   3. Background Color: Black.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
   6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black or Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Div. 09.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:
   1. Domestic Water Piping:
      a. Background Color: Blue.
      b. Letter Color: White.
   2. Sanitary Waste and Storm Drainage Piping:
      a. Background Color: Black.
      b. Letter Color: White.

END OF SECTION

S **SECTION 22 0719**

E **PLUMBING PIPING INSULATION**

A. Section includes insulating the following plumbing piping services:
   1. Domestic hot-water piping.
   2. Supplies and drains for handicap-accessible lavatories and sinks.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at pipe expansion joints for each type of insulation.
   3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   4. Detail removable insulation at piping specialties, equipment connections, and access panels.
   5. Detail application of field-applied jackets.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule".

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; Micro-Lok.
      b. Knauf Insulation; 1000-Degree Pipe Insulation.
      c. Manson Insulation Inc.; Alley-K.
      d. Owens Corning; Fiberglas Pipe Insulation.
   2. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

202 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

203 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
      d. Mon-Eco Industries, Inc.; 22-25.
   2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. 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."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
      d. Mon-Eco Industries, Inc.; 22-25.
   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. 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."

D. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 739, Dow Silicone.
      b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
      c. P.I.C. Plastics, Inc.; Welding Adhesive.
      d. Speedline Corporation; Polyco VP Adhesive.
   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. 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."

204 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
      b. Vimasco Corporation; 749.
   2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
   4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   5. Color: White.

205 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; Zeston.
      b. P.I.C. Plastics, Inc.; FG Series.
      c. Proto Corporation; LoSmoke.
      d. Speedline Corporation; SmokeSafe.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White
   4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

206 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ABI, Ideal Tape Division; 428 AWF ASJ.

2.07 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Engineered Brass Company.
      b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
      c. McGuire Manufacturing.
      d. Plumberex.
      e. Truebro; a brand of IPS Corporation.
      f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
   2. Description: Manufactured plastic wraps for covering plumbing fixture hot-water supply and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Truebro; a brand of IPS Corporation.
      b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
   2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Cleanouts.

3.03 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
   4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Div 07.

3.04 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
   4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
   5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
   6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.06 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.07 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.08 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of

inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.09 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot Water: Insulation shall be one of the following:
   1. Flexible Elastomeric: 3/4 inch (19 mm) thick.
   2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.

END OF SECTION

SECTION 22 1116 DOMESTIC WATER PIPING

PART 1 GENERAL

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.02 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.03 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions:
   1. MSS SP-123.
   2. Cast-copper-alloy, hexagonal-stock body.
   3. Ball-and-socket, metal-to-metal seating surfaces.
   4. Solder-joint or threaded ends.

F. Copper Pressure-Seal-Joint Fittings:
   1. Fittings for NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
   2. Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

G. Copper Push-on-Joint Fittings:
   1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
   2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.03 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
   1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
   2. Full-face or ring type unless otherwise indicated.

B. Solder Filler Metals: ASTM B 32, lead-free alloys.

C. Flux: ASTM B 813, water flushable.

2.04 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

PART 3 EXECUTION

3.01 EARTHWORK

A. Comply with requirements in Div 31 for excavating, trenching, and backfilling.

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 0519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 1119 "Domestic Water Piping Specialties."

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 1119 "Domestic Water Piping Specialties."

E. Install domestic water piping level without pitch and plumb.

F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 0517 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 0517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 0518 "Escutcheons for Plumbing Piping."

3.03 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 22 0529 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:

B. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.05 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.06 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 0553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.07 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
      b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
         1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
         2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
      c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
      d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
   2. Piping Tests:
      a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
      b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
      c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
      d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
      e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
      f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.08 ADJUSTING

A. Perform the following adjustments before operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
      a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
      b. Adjust calibrated balancing valves to flows indicated.
   5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
   6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.09 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Repeat procedures if biological examination shows contamination.
      e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:
   1. Hard copper tube, ASTM B 88, Type L ASTM B 88, Type M; cast or wrought copper, solder-joint fittings; and soldered joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:
   1. Hard copper tube, ASTM B 88, Type L ASTM B 88, Type M; copper, solder-joint fittings; and joints.

END OF SECTION

A.

SECTION 22 1119

DOMESTIC WATER PIPING SPECIALTIES

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.02 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa) unless otherwise indicated.

2.03 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
   1. Standard: ASSE 1001.
   2. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
   3. Body: Bronze.
   4. Inlet and Outlet Connections: Threaded.
   5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:
   1. Standard: ASSE 1011.
   2. Body: Bronze, nonremovable, with manual drain.
   3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
   4. Finish: Chrome or nickel plated.

204 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:
   1. Standard: ASSE 1012.
   2. Operation: Continuous-pressure applications.
   3. Body: Bronze.
   4. End Connections: Solder joint.
   5. Finish: Rough bronze.

205 BALANCING VALVES

A. Memory-Stop Balancing Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   2. available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Milwaukee Valve Company.
      c. NIBCO Inc.
   3. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
   4. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
   5. Size: NPS 2 (DN 50) or smaller.
   6. Body: Copper alloy.
   7. Port: Standard or full port.
   8. Ball: Chrome-plated brass.
   9. Seats and Seals: Replaceable.
   10. End Connections: Solder joint or threaded.
   11. Handle: Vinyl-covered steel with memory-setting device.

206 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves :
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Leonard Valve Company.
      b. Powers; a division of Watts Water Technologies, Inc.
      c. Symmons Industries, Inc.
   2. Standard: ASSE 1017.
   3. Pressure Rating: 125 psig (860 kPa)minimum unless otherwise indicated.

207 HOSE BIBBS

A. Hose Bibbs :
   1. Standard: ASME A112.18.1 for sediment faucets.
   2. Body Material: Bronze.
   3. Seat: Bronze, replaceable.
   4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
   5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
   6. Pressure Rating: 125 psig (860 kPa).
   7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.

208 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
   1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
   2. Pressure Rating: 125 psig (860 kPa).
   3. Operation: Loose key.

4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Chrome plated.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): Two with each wall hydrant.

209 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

210 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Precision Plumbing Products, Inc.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

211 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Precision Plumbing Products, Inc.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Water Technologies, Inc.; Watts Regulator Company.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig (860 kPa) minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
   1. Install cabinet-type units recessed in or surface mounted on wall as specified.

D. Install Y-pattern strainers for water on supply side of each solenoid valve and pump.

E. Install water-hammer arresters in water piping according to PDI-WH 201.

F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.02 CONNECTIONS

A. Comply with requirements for ground equipment in Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.03 FIELD QUALITY CONTROL

A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.04 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 1316

E SANITARY WASTE AND VENT PIPING

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service or extra heavy weight. Pipe and filling shall be marked with the collective trademark.

B. Gaskets: ASTM C 564, rubber.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301. Pipe and fitting shall be marked with the collective trade mark.

B. CISPI, Hubless-Piping Couplings:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cast Iron Soil Pipe Institute.
      b. Matco-Norca, Inc.
      c. Tyler Pipe.
      d. Charlotte Piping Company.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Cast Iron Soil Pipe Institute.
b. Tyler Pipe.
c. Charlotte Piping Company.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

204 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

205 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Shielded, Nonpressure Transition Couplings:
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Fernco Inc.
b. Standard: ASTM C 1173.

c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. Sleeve Materials:
   1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
   2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 EXECUTION

3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Div 31.

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2 (DN 50) and smaller; 1 percent downward in direction of flow for piping NPS 3 (DN 80) and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 0517 "Sleeves and Sleeve Seals for Plumbing Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 0517 "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 0518 "Escutcheons for Plumbing Piping."

3.03 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.04 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in OD's.
   2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.05 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 0529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

H. Install supports for vertical copper tubing every 10 feet (3 m).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.07 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 0553 "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

3. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

D. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   3. Copper DWV tube, copper drainage fittings, and soldered joints.

S

SECTION 22 1319

S

SANITARY WASTE PIPING SPECIALTIES

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Miscellaneous sanitary drainage piping specialties.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.03 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS

2.01 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:
   1. 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:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
   5. Closure: Countersunk, plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:
   1. 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:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Type: Threaded, adjustable housing.
   5. Body or Ferrule: Cast iron.
   6. Clamping Device: Required.
   7. Outlet Connection: Spigot.
   8. Closure: Brass plug with straight threads and gasket.
   9. Adjustable Housing Material: Cast iron with.
   10. Frame and Cover Shape: Round.
   11. Top Loading Classification: Extra Heavy Duty.
   12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :

1. 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:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, stainless-steel cover plate with screw.
8. Wall Access: Round, stainless-steel wall-installation frame and cover.

2.02 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. 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:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
      a. Josam Company; Josam Div.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Zurn Plumbing Products Group; Specification Drainage Operation.
   3. Standard: ASME A112.6.3.
   4. Top Shape: Round.
   5. Trap Material: Cast iron.
   6. Trap Pattern: P-trap.

2.03 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains :
   1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
   2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings :
   1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
   2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

C. Air-Gap Fittings :
   1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
   2. Body: Bronze or cast iron.
   3. Inlet: Opening in top of body.
   4. Outlet: Same as inlet.
   5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for

larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
   a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
   b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
   c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Assemble open drain fittings and install with top of hub 2 inches (51 mm) above floor.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.02 CONNECTIONS

A. Comply with requirements in Section 22 1316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.03 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Div 07 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.04 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 0553 "Identification for Plumbing Piping and Equipment."

3.05 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

DIVISION 23

HEATING, VENTILATION AND AIR CONDITIONING(HVAC)

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.02 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.02 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.03 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.04 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

205 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

206 P3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Thermal-hanger shield inserts.
   4. Fastener systems.
   5. Equipment supports.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 THERMAL-HANGER SHIELD INSERTS

A. For Trapeze or Clamped Systems: Shield shall cover entire circumference of pipe.

B. For Clevis or Band Hangers: Shield shall cover lower 180 degrees of pipe.

2.04 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

J. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.05 PAINTING

A. 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.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing or dissimilar metals.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
   4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
   7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
   8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
   9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb (340 kg).
      b. Medium (MSS Type 32): 1500 lb (680 kg).
      c. Heavy (MSS Type 33): 3000 lb (1360 kg).
   8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
   9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
   2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
   3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 0548

VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Isolation pads.
   2. Isolation mounts.
   3. Restrained elastomeric isolation mounts.
   4. Restrained spring isolators.
   5. Elastomeric hangers.
   6. Spring hangers.
   7. Spring hangers with vertical-limit stops.
   8. Pipe riser resilient supports.
   9. Resilient pipe guides.

1.02 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading: to comply with requirements of FBC.

1.03 ACTION SUBMITTALS

A. Product Data: For each product indicated.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATORS

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:
   1. Kinetics Noise Control.
   2. Mason Industries.
   3. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
   1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with limit-stop restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
   3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

E. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

F. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

G. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.

H. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

PART 3 EXECUTION

3.01 VIBRATION-CONTROL DEVICE INSTALLATION

A. Comply with requirements in Section 07 7200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

E. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.02 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
   3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
   4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   5. Test to 90 percent of rated proof load of device.
   6. Measure isolator restraint clearance.
   7. Measure isolator deflection.
   8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.03 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Duct labels.

1.02 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 PRODUCTS

2.01 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
   2. Letter Color: White.
   3. Background Color: Black.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
   6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Fasteners: Stainless-steel rivets.
   8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.04 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in division 9.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:
   1. Chilled-Water Piping:
      a. Background Color: Blue.
      b. Letter Color: White.
   2. Heating Water Piping:
      a. Background Color: Red.
      b. Letter Color: White.
   3. Refrigerant Piping:
      a. Background Color: Yellow.
      b. Letter Color: Black.

3.04 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
   1. Blue: For cold-air supply ducts.
   2. Yellow: For hot-air supply ducts.
   3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
   4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

A. Section Includes:
   1. Balancing Air Systems:
      a. Variable-Air-Volume systems.
   2. Balancing Hydronic Piping Systems:
      a. Variable-flow Hydronic systems.

1.02 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.03 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.04 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.
   1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC NEBB or TABB.
   2. TAB Technician: Employee of the TAB contractor and who is certified by AABC NEBB or TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:
   1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
   2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Commissioning Authority.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.05 P2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

2.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 23 3113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
   1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
   2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.02 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:
   1. Permanent electrical-power wiring is complete.

2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

203 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
   1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 0713 "Duct Insulation," Section 23 0716 "HVAC Equipment Insulation," Section 23 0719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

204 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 23 3113 "Metal Ducts."

205 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum airflow condition until the total airflow of the terminal

units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
   1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
   2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
   3. Measure total system airflow. Adjust to within indicated airflow.
   4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
   5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
      a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
   6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
      a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
   7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
   8. Record final fan-performance data.

206 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
   1. Open all manual valves for maximum flow.
   2. Check liquid level in expansion tank.
   3. Check makeup water-station pressure gage for adequate pressure for highest vent.
   4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
   5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
   6. Set system controls so automatic valves are wide open to heat exchangers.
   7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
   8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

207 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
   1. Manufacturer's name, model number, and serial number.

2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

208 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

210 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:
1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:
1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:
1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:
1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

211 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

212 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as

specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

213 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
   1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
   2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
   1. Pump curves.
   2. Fan curves.
   3. Manufacturers' test data.
   4. Field test reports prepared by system and equipment installers.
   5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB contractor.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of TAB supervisor who certifies the report.
   10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   11. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   12. Nomenclature sheets for each item of equipment.
   13. Data for terminal units, including manufacturer's name, type, size, and fittings.
   14. Notes to explain why certain final data in the body of reports vary from indicated values.
   15. Test conditions for fans and pump performance forms including the following:
      a. Settings for outdoor-, return-, and exhaust-air dampers.
      b. Conditions of filters.
      c. Cooling coil, wet- and dry-bulb conditions.
      d. Face and bypass damper settings at coils.
      e. Fan drive settings including settings and percentage of maximum pitch diameter.
      f. Inlet vane settings for variable-air-volume systems.
      g. Settings for supply-air, static-pressure controller.
      h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution

systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

214 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 0713 DUCT INSULATION

S

E

A. Section includes insulating the following duct services:
   1. Indoor, concealed supply and return air.
   2. Indoor, exposed supply and return air.
   3. Indoor, concealed exhaust between fume hood and penetration of building exterior.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
   3. Detail application of field-applied jackets.
   4. Detail application at linkages of control devices.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," and "Indoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. CertainTeed Corp.; SoftTouch Duct Wrap.
      b. Johns Manville; Microlite.
      c. Knauf Insulation; Friendly Feel Duct Wrap.
      d. Manson Insulation Inc.; Alley Wrap.
      e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. P P Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. CertainTeed Corp.; Commercial Board.
      b. Fibrex Insulations Inc.; FBX.
      c. Johns Manville; 800 Series Spin-Glas.
      d. Knauf Insulation; Insulation Board.
      e. Manson Insulation Inc.; AK Board.
      f. Owens Corning; Fiberglas 700 Series.

202 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. CertainTeed Corp.; FlameChek.
      b. Johns Manville; Firetemp Wrap.
      c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
      d. Thermal Ceramics; FireMaster Duct Wrap.
      e. 3M; Fire Barrier Wrap Products.
      f. Unifrax Corporation; FyreWrap.

203 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. 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."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. 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."

204 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

205 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
      b. Eagle Bridges - Marathon Industries; 405.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
      d. Mon-Eco Industries, Inc.; 44-05.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
   5. Color: Aluminum.
   6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants 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. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
   5. Color: White.
   6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants 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."

206 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
   4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
   5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.07 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for ducts.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
      b. Vimasco Corporation; Elastafab 894.

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 428 AWF ASJ.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
      c. Compac Corporation; 104 and 105.
      d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   2. Width: 3 inches (75 mm).
   3. Thickness: 11.5 mils (0.29 mm).
   4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 491 AWF FSK.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
      c. Compac Corporation; 110 and 111.
      d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
   2. Width: 3 inches (75 mm).
   3. Thickness: 6.5 mils (0.16 mm).
   4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
   7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 370 White PVC tape.
      b. Compac Corporation; 130.
      c. Venture Tape; 1506 CW NS.
   2. Width: 2 inches (50 mm).
   3. Thickness: 6 mils (0.15 mm).
   4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
   5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 488 AWF.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
      c. Compac Corporation; 120.
      d. Venture Tape; 3520 CW.
   2. Width: 2 inches (50 mm).
   3. Thickness: 3.7 mils (0.093 mm).
   4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
   5. Elongation: 5 percent.
   6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

209 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
   1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ITW Insulation Systems; Gerrard Strapping and Seals.
      b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:
   1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
      a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
         1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
         2) GEMCO; Perforated Base.
         3) Midwest Fasteners, Inc.; Spindle.
      b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
      c. Spindle: Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
      d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
   2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
      a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
         1) GEMCO; Nylon Hangers.
         2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
      b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
      c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
      2) GEMCO; Peel & Press.
      3) Midwest Fasteners, Inc.; Self Stick.
   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
   c. Spindle: Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.
4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
      1) AGM Industries, Inc.; RC-150.
      2) GEMCO; R-150.
      3) Midwest Fasteners, Inc.; WA-150.
      4) Nelson Stud Welding; Speed Clips.
   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1) GEMCO.
      2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. C & F Wire.

210 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
      a. For below ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.03 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
   4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
   1. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:
   1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers"

3.04 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
   a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
   b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation

segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.05 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07.

3.06 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09.
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.08 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
   1. Indoor, concealed supply and return air.
   2. Indoor, concealed exhaust between fume hood and penetration of building exterior.
   3. Indoor, exposed supply and return air.

B. Items Not Insulated:
   1. Fibrous-glass ducts.

2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.09 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air, Return-Air, Exhaust-Air, Outside-Air Ducts and Plenum Insulation: Mineral-fiber blanket, 2 inches (50 mm) thick and 1.0-lb/cu. ft. (16-kg/cu. m) nominal density, R-6.

B. Exposed, Supply-Air, Return-Air, Exhaust-Air, Outside-Air Ducts and Plenum Insulation: Mineral-fiber board, 1-1/2 inches (38 mm) thick and 3-lb/cu. ft. (48-kg/cu. m) nominal density, R-6.5.

END OF SECTION

S

E

SECTION 23 3113
METAL DUCTS

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
   2. Suspended ceiling components.
   3. Structural members to which duct will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Penetrations of smoke barriers and fire-rated construction.
   6. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Fire alarm devices.

1.05 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4
- "HVAC System Construction and Insulation."

PART 2 PRODUCTS

2.01 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved,
duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards
- Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved,
duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards
- Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.02 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and

Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lindab Inc.
   b. McGill AirFlow LLC.
   c. SEMCO Incorporated.
   d. Sheet Metal Connectors, Inc.
   e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

203 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards
- Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G90.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

204 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable,

airtight seal.

2. Tape Width: 3 inches (76 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. 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."

C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. 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."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m) and shall be rated for10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.05 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
   2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 3300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.02 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.03 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. Outdoor, Supply-Air Ducts: Seal Class A.
   3. Outdoor, Exhaust Ducts: Seal Class C.
   4. Outdoor, Return-Air Ducts: Seal Class C.
   5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
   6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
   7. Unconditioned Space, Exhaust Ducts: Seal Class C.
   8. Unconditioned Space, Return-Air Ducts: Seal Class B.
   9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
   10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
   11. Conditioned Space, Exhaust Ducts: Seal Class B.
   12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with

welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.05 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 3300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.06 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
   1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 3300 "Air Duct Accessories" for access panels and doors.
   2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
   1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
   2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
   2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
   4. Coils and related components.
   5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
   6. Supply-air ducts, dampers, actuators, and turning vanes.
   7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
   3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
   4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
   5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning

materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.07 START UP

A. Air Balance: Comply with requirements in Section 23 0593 "Testing, Adjusting, and Balancing for HVAC."

3.08 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
   1. Laboratory exhaust ductwork: Stainless steel.

B. Supply Ducts:
   1. Ducts Connected to Fan Coil Units, and Terminal Units:
      a. Pressure Class: Positive 1-inch wg (250 Pa).
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.
   2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
      a. Pressure Class: Positive 4-inch wg (1000 Pa).
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 3.
      d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Return Ducts:
   1. Ducts Connected to Fan Coil Units, and Terminal Units:
      a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 12.
   2. Ducts Connected to Air-Handling Units:
      a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 6.
      d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg (500 Pa).
      b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
      c. SMACNA Leakage Class for Rectangular: 12.
      d. SMACNA Leakage Class for Round and Flat Oval: 6.
   2. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:
      a. Type 304, stainless-steel sheet.
      b. Pressure Class: Positive or negative 3-inch wg (750 Pa).
      c. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
      d. SMACNA Leakage Class: 3.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
   1. Ducts Connected to Air-Handling Units:
      a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
      b. Minimum SMACNA Seal Class: A.
      c. SMACNA Leakage Class for Rectangular: 6.
      d. SMACNA Leakage Class for Round and Flat Oval: 3.

F. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel.
   2. Stainless-Steel Ducts:
      a. Exposed to Airstream: Match duct material.
      b. Not Exposed to Airstream: Match duct material.

G. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Velocity 1000 fpm (5 m/s) or Lower:
         1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
         2) Mitered Type RE 4 without vanes.
      b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
         1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
         2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
         3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
      c. Velocity 1500 fpm (7.6 m/s) or Higher:
         1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
         2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
         3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
         2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
         3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
         4) Radius-to Diameter Ratio: 1.5.
      b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
      c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.

H. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: Spin in.
   2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

S **SECTION 23 3300**

E **AIR DUCT ACCESSORIES**

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.
      b. Manual volume damper installations.
      c. Control-damper installations.
      d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
      e. Wiring Diagrams: For power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 PRODUCTS

2.01 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

202 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G90.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish.

C. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

203 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Air Balance Inc.; a division of Mestek, Inc.
   2. American Warming and Ventilating; a division of Mestek, Inc.
   3. Greenheck Fan Corporation.
   4. Nailor Industries Inc.
   5. Pottorff.
   6. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 3-inch wg (0.8 kPa).

E. Frame: Hat-shaped, 0.09-inch- (2.4-mm-) thick extruded aluminum, with welded corners or mechanically attached.

F. Blades: Multiple single-piece blades, end pivoted, maximum 6-inch (150-mm) width, 0.050-inch- (1.2-mm-) thick extruded aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:
   1. Material: Galvanized steel.
   2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: synthetic pivot bushings.

M. Accessories:
   1. Adjustment device to permit setting for varying differential static pressure.
   2. Counterweights and spring-assist kits for vertical airflow installations.
   3. 90-degree stops.

204 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Pottorff.
g. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:
1. Size: 0.5-inch (13-mm) diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

205 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.
7. Young Regulator Company.

B. Frames:
1. Hat shaped.
2. 0.125-inch- (3-mm-) thick aluminum.

C. Blades:
1. Multiple blade with maximum blade width of 6 inches (152 mm).

2. Opposed-blade design.
3. Aluminum.
4. 0.0747-inch- (1.9-mm-) thick dual skin.
5. Blade Edging: Closed-cell neoprene.

D. Blade Axles: 1/2-inch- (13-mm-) diameter; stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

E. Bearings:
1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

206 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream and Multiple-blade type; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 20 gage thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch- (0.61-mm) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

207 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection.

D. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

E. Blades: Airfoil, horizontal, 0.063-inch- (1.6-mm) thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.05-inch- (1.3-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

I. Damper Motors: two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26.
   3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
   5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
   6. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
   7. Electrical Connection: Coordinate with Division 26.

K. Accessories:
   1. Test and reset switches, damper mounted.

208 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ductmate Industries, Inc.
   2. Nexus PDQ; Division of Shilco Holdings Inc.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

209 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.

4. METALAIRE, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

210 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. American Warming and Ventilating; a division of Mestek, Inc.
   2. Ductmate Industries, Inc.
   3. Flexmaster U.S.A., Inc.
   4. Greenheck Fan Corporation.
   5. McGill AirFlow LLC.
   6. Nailor Industries Inc.
   7. Pottorff.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
   1. Door:
      a. Double wall, rectangular.
      b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      c. Vision panel.
      d. Hinges and Latches: 1-by-1-inch (25-by-25-mm)butt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.
   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
   3. Number of Hinges and Locks:
      a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
      b. Access Doors up to 18 Inches (460 mm) Square: Continuous and two sash locks.
      c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.
      d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

211 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized

sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
   2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.12 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Flexmaster U.S.A., Inc.
   2. McGill AirFlow LLC.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
   1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
   2. Maximum Air Velocity: 4000 fpm (20 m/s).
   3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
   4. Insulation R-value: Comply with ASHRAE/IESNA 90.1, R-6.0 minimum.

C. Flexible Duct Connectors:
   1. Clamps: Nylon strap in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
   2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.13 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft and/or control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
6. At each change in direction and at maximum 50-foot (15-m) spacing.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

K. Label access doors according to Section 23 0553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

3.02 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 3423

HVAC POWER VENTILATORS

1. Ceiling-mounted ventilators.
2. In-line centrifugal fans.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 PRODUCTS

2.01 CEILING-MOUNTED VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Carnes Company.
   2. Greenheck Fan Corporation.
   3. Loren Cook Company.
   4. PennBarry.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
   3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
   4. Motion Sensor: Motion detector with adjustable shutoff timer.
   5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
   6. Filter: Washable aluminum to fit between fan and grille.
   7. Isolation: Rubber-in-shear vibration isolators.

8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.02 IN-LINE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Carnes Company.
   2. Greenheck Fan Corporation.
   3. Loren Cook Company.
   4. Penn-Barry.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
   3. Companion Flanges: For inlet and outlet duct connections.
   4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.03 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.04 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

B. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch (25 mm). Vibration-control devices are specified in Section 23 0548 "Vibration Controls for HVAC Piping and Equipment."

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 23 0553 "Identification for HVAC Piping and Equipment."

3.02 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 3300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Adjust belt tension.
   6. Adjust damper linkages for proper damper operation.
   7. Verify lubrication for bearings and other moving parts.
   8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
   9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
   10. Shut unit down and reconnect automatic temperature-control operators.
   11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 23 0593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 23 3713

DIFFUSERS, REGISTERS, AND GRILLES

1. Rectangular and square ceiling diffusers.
2. Louver face diffusers.
3. Adjustable bar registers and grilles.
4. Fixed face registers and grilles.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 PRODUCTS

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Carnes.
b. Nailor Industries Inc.
c. Price Industries.
d. Titus.

2.02 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:
   1. Devices shall be specifically designed for variable-air-volume flows.
   2. Material: Aluminum.
   3. Finish: Baked enamel, color selected by Architect.
   4. Face Size: 24 by 24 inches (600 by 600 mm).
   5. Face Style: Three cone.
   6. Mounting: T-bar.
   7. Pattern: Fixed.

B. Louver Face Diffuser:
   1. Devices shall be specifically designed for variable-air-volume flows.
   2. Material: Aluminum.
   3. Finish: Baked enamel, color selected by Architect.

2.02 REGISTERS AND GRILLES

A. Adjustable Bar Register:
   1. Material: Aluminum.
   2. Finish: Baked enamel, color selected by Architect.
   3. Mounting: Concealed.

B. Adjustable Bar Grille:
   1. Material: Aluminum.
   2. Finish: Baked enamel, color selected by Architect.
   3. Mounting: Concealed.

C. Fixed Face Register:
   1. Material: Aluminum.
   2. Finish: Baked enamel, color selected by Architect.
   3. Mounting: Concealed.

D. Fixed Face Grille:
   1. Material: Aluminum.
   2. Finish: Baked enamel, color selected by Architect.
   3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
   4. Mounting: Concealed.

E. Linear Bar Grille:
   1. Material: Aluminum.
   2. Finish: Baked enamel, color selected by Architect.
   3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
   4. Distribution plenum.
      a. Internal insulation.
      b. Inlet damper.
   5. Mounting: Concealed.

2.03 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.01 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.02 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 74 06
PACKAGED ROOFTOP DX AIR CONDITIONING UNIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged rooftop DX air conditioning unit.

B. Unit controls.

C. Remote panel.

D. Roof mounting curb and base.

1.2 REFERENCES

A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

B. ANSI S12.60-2002 - Acoustical Performance Criteria, Design Requirements and Guidelines for Schools.

C. ARI 210 - Unitary Air Conditioning Equipment.

D. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

E. NFPA 70 - National Electric Code.

1.3 SUBMITTALS

A. Product data shall indicate dimensions, weights, capacities, ratings, fan performance acoustical data, motor electrical characteristics, gauges and finishes of materials.

B. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listing.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect unit from physical damage by storing off site until mounting frames are in place, ready for immediate installation of unit.

1.6 WARRANTY

A. Provide manufacturer's standard one (1) year parts and labor warranty for all the A/C unit's components and an extended four year parts and labor warranty on the compressor and motor. Both warranties beginning from the date of Beneficial Occupancy.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Trane

B. Carrier

C. YORK / JCI

D. Daikin

2.2 AIR CONDITIONING UNIT

A. Self-contained, packaged roof mounted, air-to-air DX air conditioning unit having the capability of cooling the required capacity of outside air from 91 Degree Fdb/78 Degree Fwb so as to supply room air at 75 Degree Fdb/50 percent RH.

B. Unit to be a high efficiency, factory assembled, pre-wired, draw-thru unit with a minimum of 14 SEER, R-410A refrigerant, suitable for low pressure operation and consist of a cabinet and frame, supply fan, controls, air filters, vertical discharge ducting, roof curb, serviceable access panels with screwdriver operated flush cam type fasteners, refrigerant cooling coil and compressor, condenser coil and fan. and compressor reheat recovery controlled by a duct mounted humidistat.

C. Provide unit with a premium quality motorized outside air damper and a manual volume damper for fixed outside air makeup quantity.

D. The final equipment location and design selection design shall comply with the maximum noise criteria levels for classrooms and other core learning spaces.

2.3 CASING

A. Galvanized steel bonderized and coated with baked enamel finish, access doors or removable access panels with quick screwdriver operated flush cam type fasteners. Structural members to be minimum 18 gauge. Removable panels to be minimum 20 gauge. Insulate unit with one (1") inch thick, neoprene-coated or foil-faced glass-fiber insulation. Insulation to be adhered and pinned to the casing.

B. Construct drain pan from galvanized steel with welded corners and a bottom drain. Pitch entire pan to drain connection.

C. The manufacturer will be responsible for providing additional rigid board type insulation to prevent the unit from sweating under the encountered operating conditions.

2.4 SUPPLY FAN

A. Forward curved, double width, double inlet centrifugal type fan resiliently mounted with V-belt drive and rubber isolated hinge mounted motor.

2.5 CONDENSER FAN

A. Direct drive, statically and dynamically balanced propeller fan, permanently lubricated and weatherproof motor UL listed for outdoor use, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

2.6 MOTORS AND DRIVES

A. Motors: Maximum horsepower as indicated and specified. Protect motor against contact failure, loss of any phase (single phasing), low voltage, high voltage, voltage unbalance, phase reversal and wind for specified voltage having a minimum power factor of 85 to 100 percent and a minimum efficiency of 91.7 percent at 100 percent load as per IEEE Test Procedure 112, Method B.

B. Design for continuous operation in 40 Degree C environment and for temperature rise under provisions of ANSI/NEMA MG 1 limits for insulation class, service factor and motor enclosure.

2.7 EVAPORATOR COIL

A. Evaporator coil with minimum 3/8 inch copper tubes mechanically expanded onto aluminum plate fins. No Microchannel coils accepted.

2.8 COIL COATING

A. Provide the coil tubing, fins and end plates with a factory applied dip-processed coating for corrosion protection.

B. Ensure coating materials have passed a **MINIMUM OF 1000 HOURS OF SALT SPRAY EXPOSURE** in testing performed by an independent laboratory under provisions of ASTM B117.97 standards.

C. Ensure the coating material and process as applied to fin tube coils provides an effective corrosion protection in a pH range of 1.0 to 14.0.

D. Prepare the coils through the manufacturer’s procedural cleaning steps allowing for drying prior to the coating process.

E. Apply a 0.5 to 1.0 dry mil thickness of acrylic polymer resin primer. Coating to be fully cured prior to applying the protective finish coat.

F. Apply the coil corrosion protection coating built-up to a dry mil thickness of 2.0 to 3.0.

G. Ensure the corrosion protection coating is built-up on the fin edges.

H. Ensure the coating is field-repairable and provide touchup product for this purpose.

I. Ensure the entire coating process is similar to the Husky Coil Coat patented process as manufactured by Bronz-Glow Technologies, Inc. (Jacksonville, FL). Other approved coatings are as manufactured by Thermoguard (Coconut Creek, FL).

J. Ensure the company providing the coating process also provides a five (5) year coil warranty.

2.9 FILTER SECTION

A. Provide flat type filter section constructed of galvanized steel and containing filter guides and hinged access doors on both sides for side loading of filters.

B. Provide four (4") inches depth filter section, UL Class 2, high efficiency, minimum MERV 13 disposable, mini-pleated type air filters with an atmospheric dust spot (ADS) efficiency of 80-85 percent.

2.10 REFRIGERANT CIRCUIT

A. Unit to contain one sealed refrigerant circuit including one hermetic compressor, thermal expansion valve metering device, finned tube air-to-refrigerant heat exchanger, refrigerant expansion valve and service ports.

B. Compressor to be a high efficiency type designed for cooling only and mounted on vibration isolators. Provide compressor motor with internal overload protection.

C. Finned tube coil to be constructed of lanced aluminum fins not exceeding eleven per inch bonded to rifled copper tubes in a staggered pattern not less than six row deep and have a 450 PSIG working pressure.

2.11 REFRIGERANT

A. Refrigerant: Chiller refrigerant to be R-410A or a refrigerant that does not use CFCs or cause the project to exceed the threshold set by the formula **LCGWP + LCODP X 10^6 ≤ 100** for ozone depletion and global warming potential.

B. Receiver shall be designed to provide the refrigerant circuit with the proper amount of refrigerant so that the unit shall operate at the highest efficiency over the entire range of load conditions.

2.12 ROOF CURB

A. Roof Curb: Pre-fabricated roof curb fabricated of minimum 18 gauge galvanized steel with continuously welded seams, 2 inch flashing flange, 4 inch minimum deck flange, 1 inch insulation for full height of curb and around inside perimeter of curb. Roof curb shall be a minimum of 2 inches smaller than the fan to allow for the roof flashing membrane. Roof curb shall possess a Miami-Dade NOA and be Model GPI as manufactured by Greenheck, Thybar or approved equal.

B. Roof curb height shall be 18 inches above finished roofing with reinforced fastening return at top.

2.13 PIPING

A. Condenser and condensate drain connections to be constructed of brass female pipe thread fittings mounted flush to side of cabinet exterior with optional stainless steel, braided hose kit with swivel connectors. Condensate piping to be copper Type "L".

2.14 ELECTRICAL

A. Factory or field installed energy management relay to allow unit control by an external source.

B. Provide a lockout indicating terminal in the low voltage circuit.

C. When the safety controls are activated to prevent compressor short cycling, the lockout circuit must be reset at the thermostat or main circuit breaker.

D. Disconnect Switch: Factory mount disconnect switch.

2.15 CONTROLS

A. Provide temperature controls consisting of field installed supply air sensor and discharge air reset sensor.

B. Controls to be a low voltage, electric solid-state microcomputer-based, seven-day programmable room thermostat located as indicated. Ensure room thermostat incorporates:
1. Preferential rate control to minimize overshoot deviation from set point.
2. Instant override of set point for continuous or timed period from one hour to 31 days.
3. Short cycle protection.
4. Switch selection features including digital display, remote sensor, fan on-auto.

C. Ensure room thermostat display includes:
1. Time of day.
2. Actual room temperature.
3. System Model Indication: Cooling, auto, off, fan auto, fan on.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine supports to receive unit and related ductwork for:
1. Horizontal mounting surface.
2. Water tightness.
3. Proper anchoring.
4. Unevenness, irregularities and incorrect dimensions that would affect quality and execution of installation.

B. Verify that proper power supply is available.

C. Do not proceed with installation until supports conform to specifications requirements.

3.2 INSTALLATION

A. Install unit under provisions of the manufacturer's instructions.

B. Identify unit with its tag showing the building number, unit number and area served.

C. Mount unit on a factory-built roof mounting curb providing a watertight enclosure to protect the ductwork and utility services. Verify that the roof mounting curb is installed level.

D. Unit shall be anchored to sustain hurricane force winds as outlined in the current ASCE 7 and details of the method of anchoring shall be provided on the mechanical drawings and detailed on the structural drawings.

E. Verify that during construction, the unit is fitted with four (4”) inches depth, MERV 13 efficiency air filters.

F. During construction, keep unit inlet and outlet sealed with polyethylene sheet to prevent accumulation of construction dust inside unit.

3.3 CLEANING

A. Clean tar or other debris from exterior of casings.

B. Remove debris and waste materials resulting from installation.

C. Do not operate unit until area served has been cleaned and filters are in place.

3.4 TEST AND ADJUST

A. Start equipment in presence of the unit manufacturer representative noting any unbalance, slippage of belts, unusual or similar indication of improper operation.

B. After installation, test unit to demonstrate proper operation of unit at performance requirements specified including running balance and noise considerations, proper cooling air flow.

C. Correct any deficiencies in unit operation.

D. Prior to Test and Balance, remove the filters and replace with a new set of MERV 13 efficiency air filters.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals for cables.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THW and THHN-THWN.

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC metal-clad cable and Type MC.

2.02 CONNECTORS AND SPLICES

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:
   1. AFC Cable Systems, Inc.
   2. Hubbell Power Systems, Inc.
   3. O-Z/Gedney; EGS Electrical Group LLC.
   4. 3M; Electrical Products Division.
   5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.04 SLEEVE SEALS

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:

C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:
   1. Advance Products & Systems, Inc.
   2. Calpico, Inc.
   3. Metraflex Co.
   4. Pipeline Seal and Insulator, Inc.
   5. Hilti, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
   1. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   2. Pressure Plates: Stainless steel. Include two for each sealing element.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THW, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

G. MC Cable: for lighting fixtures whips and system furniture connections.

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

I. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.04 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both wall surfaces.

E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.05 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.06 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
      a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
      b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

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SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. This Section includes methods and materials for grounding systems and equipment.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) 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 (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.02 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

PART 3 EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   4. Single-phase motor and appliance branch circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Armored and metal-clad cable runs.
   8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
   9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
   10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

G. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.03 INSTALLATION

A. 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.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
   1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install [tinned]bonding jumper to bond across flexible duct connections to achieve continuity.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:
    1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 5 ohms.
    2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 3 ohms.
    3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
    4. Power Distribution Units or Panelboards Serving Electronic Equipment: 2 ohm(s).

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.02 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
   2. Fittings for EMT: Steel, compression type.

2.02 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.03 METAL WIREWAYS

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:
   1. Cooper B-Line, Inc.
   2. Hoffman.
   3. Square D; Schneider Electric.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 or 3R, unless otherwise indicated.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

204 NONMETALLIC WIREWAYS

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:
   1. Hoffman.
   2. Lamson & Sessions; Carlon Electrical Products.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

205 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Prime coating, ready for field painting.
   1. 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:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Thomas & Betts Corporation.
      b. Walker Systems, Inc.; Wiremold Company (The).
      c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
   1. 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:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Butler Manufacturing Company; Walker Division.
      b. Enduro Systems, Inc.; Composite Products Division.
      c. Hubbell Incorporated; Wiring Device-Kellems Division.
      d. Lamson & Sessions; Carlon Electrical Products.
      e. Panduit Corp.
      f. Walker Systems, Inc.; Wiremold Company (The).
      g. Wiremold Company (The); Electrical Sales Division.

206 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Plastic.

I. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.

PART 3 EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed Conduit: Rigid steel conduit.
   2. Concealed Conduit, Aboveground: Rigid steel conduit, EMT.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: Rigid steel conduit.
   7. Raceways for Optical Fiber or Communications Cable: EMT.
   8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.02 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

K. Raceways for Optical Fiber and Communications Cable: Install as follows:
   1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
   2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
   3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by NFPA 70.

M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
   1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
      c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
      d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

O. 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.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
   b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.04 FIRESTOPPING

A. 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."

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.02 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.03 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 PRODUCTS

2.01 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.02 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

203 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

204 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

205 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

206 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type I:
1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils (0.1 mm).
3. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
4. 3-Inch (75-mm) Tensile According to ASTM D 882: 30 lbf (133.4 N), and 2500 psi (17.2 MPa).

D. Tag: Type ID:
1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils (0.125 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf (311.3 N), and 4600 psi (31.7 MPa).

207 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:
1. Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

208 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.09 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 10-foot (3-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Colors for 480/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
      d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
      d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION

S **SECTION 26 0923**

E **LIGHTING CONTROL DEVICES**

1. Photoelectric switches.
2. Indoor occupancy sensors.

B. Related Requirements:
1. 1. Lighting system controls shall be integrated to the existing Legacy system (Delta Controls at west campus) VIA Bacnet medium.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data

PART 2 - PRODUCTS

2.01 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Mfg. Company Inc.
5. NSi Industries LLC; TORK Products.
6. Tyco Electronics; ALR Brand.

C. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Programs: Eight on-off set points on a 24-hour schedule.
5. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
6. Programs: Each channel is individually programmable with eight on-off set points on a 24-hour schedule.
7. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
8. Astronomic Time: All channels.
9. Automatic daylight savings time changeover.
10. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

D. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: DPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic time dial.
6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

202 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC; TORK Products.
4. Tyco Electronics; ALR Brand.

C. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.

203 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
1. Bryant Electric; a Hubbell company.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Mfg. Company Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Sensor Switch, Inc.
8. Square D; a brand of Schneider Electric.
9. Watt Stopper.
10. Delta controls

C. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:
   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

D. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

E. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

F. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

204 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Bryant Electric; a Hubbell company.
   2. Cooper Industries, Inc.
   3. Hubbell Building Automation, Inc.
   4. Leviton Mfg. Company Inc.
   5. Lightolier Controls.
   6. Lithonia Lighting; Acuity Lighting Group, Inc.
   7. Sensor Switch, Inc.
   8. Square D; a brand of Schneider Electric.
   9. Watt Stopper.
   10. Delta Controls.

C. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

D. Wall-Switch Sensor Tag WS1:
   1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m).
   2. Sensing Technology: Dual technology - PIR and ultrasonic.
   3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
   4. Voltage: Match the circuit voltage; type.
   5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
   7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
   8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

E. Wall-Switch Sensor Tag WS2:
   1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
   2. Sensing Technology: PIR.
   3. Switch Type: SP, manual "on," automatic "off."
   4. Voltage: Match the circuit voltage; type.
   5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
   7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
   8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.05 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Allen-Bradley/Rockwell Automation.

2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Corporation.
4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
5. Square D; a brand of Schneider Electric.

C. Description: Electrically operated and mechanically held, combination-type lighting contactors with, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.06 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

C. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

D. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

E. Identify components and power and control wiring according to Section 26 0553 "Identification for Electrical Systems."

3.02 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

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SECTION 26 2726
WIRING DEVICES

A. This Section includes the following:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Snap switches and wall-box dimmers.
   3. Solid-state fan speed controls.
   4. Wall-switch and exterior occupancy sensors.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   3. Leviton Mfg. Company Inc. (Leviton).
   4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.02 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), 5352 (duplex).
      b. Hubbell; HBL5351 (single), CR5352 (duplex).
      c. Leviton; 5891 (single), 5352 (duplex).
      d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.03 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GF20.
b. Pass & Seymour; 2084.

204 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Pilot Light Switches, 20 A:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 2221PL for 120 V and 277 V.
b. Hubbell; HPL1221PL for 120 V and 277 V.
c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
d. Pass & Seymour; PS20AC1-PLR for 120 V.
3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 2221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.
3. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.

d. Pass & Seymour; 1251L.

2.05 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable Decora type; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
   1. 600 W; dimmers shall require no derating when ganged with other devices. Illuminated when "OFF."

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.06 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.
   1. Continuously Decora type, 1.5 A.
   2. Three-speed adjustable slider, 1.5 A.

2.07 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
   3. Material for Unfinished Spaces: Galvanized.
   4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations.
   5. Material for Public Locations: Stainless Steel.
   6. All wall plates to be engraved with circuit number serving device.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant thermoplastic with lockable cover.

2.08 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.09 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.
   1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected crtical to Emergency Power System: Red.
   3. TVSS Devices: Blue.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:
1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."
   1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION

SECTION 26 28 00

CIRCUIT AND MOTOR DISCONNECTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

B. Requirements of the following Division 26 Sections apply to this section:

1. Basic Electrical Requirements
2. Fuses.

1.02 SUMMARY

A. This Section includes circuit and motor disconnects.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 26 Section "Wiring Devices" for snap switches used as motor disconnects.

1.03 SUBMITTALS

A. Product data for each type of product specified.

B. Maintenance data for circuit and motor disconnects, for inclusion in Operation and Maintenance Manual specified in Division 01 and Division 26 Section “Basic Electrical Requirements”.

1.04 QUALITY ASSURANCE

A. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code" and which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. General Electric
2. Westinghouse
3. Siemens ITE
4. Square D Company.

2.02 CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. General: Provide heavy duty circuit and motor disconnect switches in types, sizes, duties, features, ratings, and enclosures as required. Provide NEMA 1 enclosure except for outdoor switches, and other indicated locations provide NEMA 3R enclosures with raintight hubs. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.

B. Fusible Switches: Heavy duty switches, with fuses of classes and current ratings indicated. See Section "FUSES" for specifications. Where current limiting fuses are indicated, provide switches with non- interchangeable feature suitable only for current limiting type fuses.

C. Non-fusible Disconnects: Heavy dutyswitches of classes and current ratings as indicated.

D. Service Switches: Heavy duty fusible switches. UL listed for use as service equipment under UL Standard 98 or 869.

2.03 ACCESSORIES

A. Electrical Contacts and Interlocks: Provide number and arrangement of interlocks and contacts in switches as required.

B. Captive Fuse Pullers: Provide built-in fuse pullers arranged to facilitate fuse removal.

C. Rejection Clips: Provide rejection clips for elevator motor/controller disconnect as required.

PART 3 EXECUTION

3.01 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECTS

A. General: Provide circuit and motor disconnect switches as indicated and where required by the Code. Comply with switch manufacturers' printed installation instructions.

3.02 FIELD QUALITY CONTROL

A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Except as otherwise indicated, do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Cartridge fuses rated 600 VAC and less for use in control circuits enclosed switches, enclosed controllers and motor-control centers.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

C. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Bussmann, Inc.
   2. Edison Fuse, Inc.
   3. Ferraz Shawmut, Inc.
   4. Littelfuse, Inc.

2.02 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 EXECUTION

3.01 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK5, time delay.

B. Control Circuits: Class CC, fast acting.

3.02 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.03 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION

SECTION 26 5100

INTERIOR LIGHTING

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:
1. Section 26 0923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 26 2726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. All LED luminaires shall be UL listed with a minimum of 5 years warranty, and rated by IESNA testing standards LM-79 and LM-80. All luminaires shall be “Energy Star” certified

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include product(s) indicated on the drawings. No substitutions, basis of design product is to match existing.

2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to

prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
      b. UV stabilized.
   2. Glass: Annealed crystal glass unless otherwise indicated.

I. All LEDs and electrical discharge luminaires shall be equipped with an internal in line fuse, and an adequate Surge Protection Device (SPD).

203 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 10 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: 0.88 or higher.
   10. Power Factor: 0.95 or higher.

B. luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
   1. Ballast Manufacturer Certification: Indicated by label.

D. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

E. Ballasts for Low-Temperature Environments: Electronic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.

F. Ballasts for Residential Applications: Fixtures designated as "Residential" may use low-power-factor electronic ballasts having a Class B sound rating and total harmonic distortion of approximately 30 percent.

G. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
   1. Dimming Range: 100 to 5 percent of rated lamp lumens.
   2. Ballast Input Watts: Can be reduced to 20 percent of normal.
   3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
   4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

H. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
   1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
      a. High-Level Operation: 100 percent of rated lamp lumens.
      b. Low-Level Operation: 30 percent of rated lamp lumens.
   2. Ballast shall provide equal current to each lamp in each operating mode.

3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

I. Ballasts for Tri-Level Controlled Lighting Fixtures: Electronic type.
   1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
      a. High-Level Operation: 100 percent of rated lamp lumens.
      b. Low-Level Operation: 30 and 50 percent of rated lamp lumens.
   2. Ballast shall provide equal current to each lamp in each operating mode.
   3. Compatibility: Certified by manufacturer for use with specific tri-level control system and lamp type indicated.

204 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.95 or higher.
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

205 LED SOURCES MUST MEET THE FOLLOWING REQUIREMENTS:

A. Luminaires must be rated for -40°C to +50°C operation

B. Correlated Color Temperature (CCT) shall be: Nominal CCT: 4000 K

C. Duv tolerance of 0.001 ± 0.006

D. Color Rendering Index (CRI): = 85

E. Luminaire manufacturer must submit reliability reports indicating that the manufacturer of the LED (chip, diode, or package) has performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows:
   1. High Temperature Operating Life (HTOL)
   2. Room Temperature Operating Life (RTOL)
   3. Low Temperature Operating Life (LTOL)
   4. Powered Temperature Cycle (PTMCL)
   5. Non-Operating Thermal Shock (TMSK)
   6. Mechanical Shock
   7. Variable Vibration Frequency
   8. Solder Heat Resistance (SHR)

206 LED DRIVER POWER SUPPLY UNITS (PSUS) INCLUDING DRIVERS MUST MEET THE FOLLOWING REQUIREMENTS:

A. Must have a minimum efficiency of 85%

B. Must be rated to operate between -40°C to +50°C

C. Input Voltage: Per plans.

D. Output current: 350mA DC (+/- 5%)

E. Power supplies can be UL Class I or II output

F. Operating frequency must be 50/60 Hz

G. Drivers must have a Power Factor (PF) of: = 0.90

H. Drivers must have a Total Harmonic Distortion (THD) of: = 20%

I. Drivers must comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards

J. Drivers must be Reduction of Hazardous Substances (RoHS) compliant.

K. Driver life rating: Less than 0.5% failure rate at 150,000 operating hours (at 350mA drive current and a minimum fixture operating ambient of 22°C)

L. Load regulation: +/- 1% from no load to full load

M. Output ripple: < 10%

N. Driver shall be provided with primary fusing, overheat protection, self-limited short circuit protection and overload protection.

O. Driver shall be able to be removed from below ceiling without using tools for recessed troffer fixtures.

207 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
   1. Emergency Connection: Operate 2 fluorescent lamp(s) continuously at an output of full lamp lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
   2. Nightlight Connection: Operate one fluorescent lamp continuously.
   3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
      a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   4. Battery: Sealed, maintenance-free, nickel-cadmium type.
   5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
   6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

208 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
   2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

209 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
   1. Battery: Sealed, maintenance-free, lead-acid type.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
   7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

210 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 4100 K, and average rated life 20,000 hours unless otherwise indicated.

B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 4100 K, and average rated life of 20,000 hours unless otherwise indicated.

C. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 4100 K, average rated life of 10,000 hours at three hours operation per start[, unless otherwise indicated.
   1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
   2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
   3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
   4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
   5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
   6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
   7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

211 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 0529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

B. Verify that suitable support frames are installed where required.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Comply with NFPA 70 for minimum fixture supports.

B. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
   3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

C. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

D. Coordinate locations of outlet boxes as required for installation of luminaires provided under this section.

E. Install products according to manufacturer's instructions.

F. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

I. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

J. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

K. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

L. Install accessories furnished with each luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. Emergency Lighting Units: Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

O. Exit Signs: Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

P. Install lamps in each luminaire.

Q. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

DIVISION 28

ELECTRONIC SAFETY AND SECURITY

SECTION 28 3111

FIRE ALARM DETECTION SYSTEM

1.01 SUMMARY NETWORK FIRE ALARM CONTROL PANEL (NODE)

A. Network fire alarm control panels shall include all features as described in this specification for stand-alone FACPs and shall have network communication capabilities as described herein.
   1. All points monitored and controlled by a single node shall be capable of being programmed as "Public". Each point made public to the network may be programmed to be operated by any other node connected to the network.
   2. Network communications shall be capable of supporting "point lists" that can be handled as though they were a single point.

B. The network shall provide a means to log into any node on the system via a laptop computer or CRT/Keyboard and have complete network access (Set Host) for diagnostics, maintenance reporting, and information gathering of all nodes in the system. Systems not meeting this requirement must provide all diagnostic tools required to support this function from selected points on the network. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.

C. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

D. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
   1. Fire alarm system detection and notification operations.
   2. Control and monitoring of elevators, and other equipment as indicated in the drawings and specifications.
   3. One-way supervised automatic voice alarm operations.

1.02 SCOPE OF WORK

A. The existing fire alarm system serving buildings #1000, #2000 and #3000 shall remain in operation while the new fire alarm system devices are installed, activated and tested. A certification letter shall be issued by the Authority Having Jurisdiction for acceptance of the existing fire alarm system with new devices installed as part of this project.

1.03 ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

A. Manufacturers: The equipment and service described in this specification are those supplied and supported by SimplexGrinnell and represent the base bid for the equipment. No substitutions shall be accepted.

1.04 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.

B. The system and all associated operations shall be in accordance with the following:
   1. FBC, 2007 Edition with 2009 Supplements
   2. NFPA 72, National Fire Alarm Code, 2007 Edition

3. NFPA 70, National Electrical Code, 2008 Edition
4. NFPA 101, Life Safety Code, 2006 Edition
5. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 Edition
6. Local Jurisdictional Adopted Codes and Standards
7. ADA Accessibility Guidelines

1.05 SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.

B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing multiple site specific configuration program revisions with one active and one in reserve. Panel shall be capable of full system operation during new site specific configuration download, master exec downloads, and slave exec downloads.

C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

D. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.

E. Wiring/Signal Transmission:
1. Transmission shall be hard-wired using separate individual circuits for each zone of alarm operation, as required or addressable signal transmission, dedicated to fire alarm service only.
2. System connections for initiating device circuits shall be Class B, Style D, signaling line circuits shall be Class B, Style 4 and notification appliance circuits shall be Class B, Style Y.
3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

F. Remote Access:
1. FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem TCP/IP Ethernet connection.
2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
3. FACP shall have the capability to provide third party access through a serial interface connection and be agency listed for specific interfaces and for the purpose.
4. FACP shall have the capability to provide remote access via an Internet/Intranet Interface. The Internet interface shall provide an alternative access to system information using the familiar interface of a standard Internet browser. A remotely located fire professional can use this access to analyze control panel status during non-alarm conditions and can also use this information to assist local fire responders during alarm conditions.

G. Network communication:
1. Network node communication shall be through a token ring, hub, or star topology configuration, or combination thereof.

2. A single open, ground or short on the network communication loop shall not degrade network communications. Token shall be passed in opposite direction to maintain communications throughout all network nodes. At the same time the status of the communication link shall be reported.
3. If a group of nodes becomes isolated from the rest of the network due to multiple fault conditions, that group shall automatically form a sub-network with all common interaction of monitoring and control remaining intact. The network shall be notified with the exact details of the lost communications.
4. Fiber optics communication shall be provided via a fiber optics modem. Modem shall multiplex audio signals and digital communication via full duplex transmission over a single fiber optic cable, either single mode or multi mode.
5. The communication method shall be NFPA 72 style 7.

H. Required Functions: The following are required system functions and operating features:
1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
2. Noninterfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.
3. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the type of device, the operational state of the device (i.e alarm, trouble or supervisory) and shall display the custom label associated with the device.
4. Selective Alarm: A system alarm shall include:
   a. Indication of alarm condition at the FACP and the annunciator(s).
   b. Identification of the device /zone that is the source of the alarm at the FACP and the annunciator(s).
   c. Operation of audible and visible notification appliances until silenced at FACP.
   d. Selectively closing doors normally held open by magnetic door holders.
   e. Unlocking designated doors.
   f. Closing smoke dampers on system serving zone where alarm is initiated.
   g. Initiation of elevator Phase I functions (recall, shunt trip, illumination of indicator in cab, etc.) in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated, as appropriate.
5. Supervisory Operations: Upon activation of a supervisory device such as a fire pump power failure, tamper switch, the system shall operate as follows:
   a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
   b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
   c. Record the event in the FACP historical log.
   d. Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
6. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.
7. System Reset
   a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for

re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."

b. Should an alarm condition continue, the system will remain in an alarmed state.

8. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
9. WALKTEST: The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
   a. The city circuit connection and any suppression release circuits shall be bypassed for the testing group.
   b. Control relay functions associated with one of the 8 testing groups shall be bypassed.
   c. The control unit shall indicate a trouble condition.
   d. The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
   e. The unit shall automatically reset itself after signaling is complete.
   f. Any opening of an initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

I. Analog Smoke Sensors:
1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported . The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
6. The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
1. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

2. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

J. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.
   1. Automatic Voice Evacuation Sequence:
      a. The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
      b. All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.

K. Speaker: Speaker notification appliances shall be listed to UL 1480.
   1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted/shielded wire.
   2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
   3. The speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for general signaling.

L. Manual Voice Paging
   1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.
   2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
   3. Total building paging shall be accomplished by the means of an "All Call" switch.

M. Fire Suppression Monitoring:
   1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
   2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
   3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.

N. Power Requirements
   1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
   2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
   3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
   4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
   5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
   6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
   7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.

8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.06 SUBMITTALS

A. General: Submit the following according to Conditions of Contract.
   1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification.
   2. Wiring diagrams from manufacturer.
   3. Shop drawings showing system details including location of FACP, all devices and circuiting.
   4. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate in accordance with the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
   5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, relay, sensor, and auxiliary control circuits.
   6. Operating instructions for FACP.
   7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
   8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
   9. Record of field tests of system.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions, if required, to make clarifications or revisions to obtain approval.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A factory authorized installer is to perform the work of this section.

B. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

PART 2 PRODUCTS

2.01 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".

B. The following FACP hardware shall be provided:
   1. Power Limited base panel with beige cabinet and door, 120 VAC input power.
   2. 2,000 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
   3. 2,000 points of Network Annunciation at FACP Display when applied as a Network Node.
   4. 2000 points of annunciation where one (1) point of annunciation equals:
      a. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
      b. 1 LED on panel or 1 switch on panel.
   5. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FACP LCD Display.
   6. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
   7. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.

8. Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).
9. Where required provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.
10. Power Supplies with integral intelligent Notification Appliance Circuit Class B for system expansion.
11. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.
12. The FACP shall support up to (5) RS-232-C ports and one service port. All (5) RS-232 Ports shall be capable of two-way communications.
13. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
14. Modular Network Communications Card.

C. Voice Alarm: Provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:
   1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface. Each amplifier shall be capable of performing constant supervision for non-alarm audio functions such as background music and general paging.
   2. All announcements are made over dedicated, supervised communication lines. All risers shall support Class B wiring for each audio channel.
   3. Eight channel digitally multiplexed audio for systems that require more than two channels of simultaneous audio. Up to 8 channels of audio shall be multiplexed on either a style 4 or style 7 twisted pair.
   4. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.
   5. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.

D. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):
   1. Amplifiers, voice and telephone control circuits
   2. Addressable Signaling Line Circuits
   3. Initiating Device Circuits
   4. Notification Appliance Circuits
   5. Auxiliary Control Circuits
   6. Graphic Annunciator LED/Switch Control Modules
      a. In systems with two or more Annunciators and/or Command Centers, each Annunciator/Command Center shall be programmable to allow multiple Annunciators/Command Centers to have equal operation priority or to allow hierarchal priority control to be assigned to individual Annunciator/Command Center locations.

E. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

F. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

202 REMOTE LCD ANNUNCIATOR

A. Provide a remote LCD Annunciator as shown on drawings with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys; Status LEDs and LCD Display as the FACP.

B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.

C. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.

D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
   1. 40 character custom location label.
   2. Type of device (e.g. smoke, pull station waterflow).
   3. Point status (e.g., alarm, trouble).

F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

203 EMERGENCY POWER SUPPLY

A. General: Components include battery, charger, and an automatic transfer switch.

B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm notification devices in alarm mode for a period of 15 minutes.

204 ADDRESSABLE MANUAL PULL STATIONS

A. Description: Addressable single action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

B. Protective Shield: Where required, as indicated on the drawings, provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

205 SMOKE SENSORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
   1. Factory Nameplate: Serial number and type identification.
   2. Operating Voltage: 24 VDC, nominal.
   3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
   4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking

mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
8. The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI.
9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
10. Removal of the sensor head for cleaning shall not require the setting of addresses.

B. Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type.

C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.

D. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.

1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct smoke sensor shall be provided by the FACP.
2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
3. Duct Housing shall provide a relay control trouble indicator Yellow LED.
4. Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
6. Duct Housing shall provide a magnetic test area and Red sensor status LED.
7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
8. Each duct smoke sensor shall have a Remote Test Station with an alarm LED and test switch.
9. Where indicated provide NEMA 4X weatherproof duct housing enclosure that shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

206 HEAT SENSORS

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and] programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.

D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

207 ADDRESSABLE CIRCUIT INTERFACE MODULES

A. Addressable Circuit Interface Modules: Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of AHU systems.

B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.

C. There shall be the following types of modules:
   1. Type 1: Monitor Circuit Interface Module:
      a. For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
      b. For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.
   2. Type 2: Line Powered Monitor Circuit Interface Module
      a. This type of module is an individually addressable module that has both its power and its communications supplied by the two wire signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.
      b. This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.
   3. Type 3: Single Address Multi-Point Interface Modules
      a. This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status conditions (normal, open, current limited, and short). The input circuits and output relay operation shall be controlled independently and disabled separately.
      b. This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited, and short). The two-wire signaling line circuit shall supply power and communications to the module.
      c. This dual point module shall monitor an unsupervised normally open, dry contact with one point and control an output relay with the other point, using a single address. The two-wire signaling line circuit shall supply power and communications to the module.
   4. Type 4: Line Powered Control Circuit Interface Module
      a. This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

5. Type 5: 4-20 mA Analog Monitor Circuit Interface Module
   a. This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.

D. All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

208 MAGNETIC DOOR HOLDERS

A. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 120VAC, a 24VAC or a 24VDC source, and develop a minimum of 25 lbs. holding force.

B. Material and Finish: Match door hardware.

209 ADDRESSABLE ALARM NOTIFICATION APPLIANCES

A. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).
   1. Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
   2. Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be permitted. Up to 63 appliances can be supported on a single channel.
   3. Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.

B. Addressable Controller: Addressable Controller shall supervise Channel (SLC) wiring, communicate with and control addressable notification appliances. It shall be possible to program the High/Lo setting of the audible (horn) appliances by channel from the addressable controller.

C. Visible/Only: Addressable strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

D. Speaker/Visible: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing. The S/V shall be listed to UL 1971 and UL 1480. Addressable functionality controls visible operation, while the speaker operates on a 25VRMS or 70.7VRMS NAC.
   1. Twisted/shielded wire is required for speaker connections on a standard 25VRMS or 70.7VRMS NAC and UTP conductors, having a minimum of 3 twists per foot is required for addressable strobe connections.

2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
3. The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for general signaling.
4. The S/V installs directly to a 4" square, 1 ½" deep electrical box with 1 ½" extension.

E. Accessories: The contractor shall furnish the necessary accessories.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
1. Factory trained and certified personnel.
2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
3. Personnel licensed or certified by state or local authority.

3.02 EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

B. Existing Fire Alarm Equipment shall be maintained fully operational until the new equipment has been tested and accepted.

C. Equipment Removal: After acceptance of the new fire alarm system, disconnect and remove the existing fire alarm equipment and restore damaged surfaces. Package operational fire alarm and detection equipment that has been removed and deliver to the Owner. Remove from the site and legally dispose of the remainder of the existing material.

D. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

E. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

F. Install manual station with operating handle 48 inches (1.22 m) above floor. Install wall mounted audible and visual notification appliances not less than 80 inches (2.03 m) above floor to bottom of lens and not greater than 96 inches (2.44 m) above floor to bottom of lens.

G. Mount outlet box for electric door holder to withstand 80 pounds pulling force.

H. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, duct smoke detectors.

I. Automatic Detector Installation: Conform to NFPA 72.

3.03 PREPARATION

A. Coordinate work of this Section with other affected work and construction schedule.

3.04 WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).

B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written

instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Mount end-of-line device in box with last device or separate box adjacent to last device for Class "B" supervision.

E. Ethernet circuits shall be provided to the Fire Alarm Control Panel as shown on the plans.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
   1. Factory trained and certified.
   2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.

C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

D. Inspection:
   1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
   2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

E. Acceptance Operational Tests:
   1. Perform operational system tests to verify conformance with specifications:
      a. Each alarm initiating device installed shall be operationally tested. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test emergency power supply to minimum durations specified.
      b. Test each Notification Appliance installed for proper operation.
      c. Test Fire Alarm Control Panel and Remote Annunciator.
   2. Provide minimum 10 days notice of acceptance test performance schedule to Owner, and local Authority Having Jurisdiction.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Use NFPA 72 Forms for documentation.

H. Final Test, Record of Completion, and Certificate of Occupancy:
   1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy. Provide completed NFPA 72 Record of Completion form to Owner and AHJ.

3.06 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

3.07 TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
   1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
   2. Schedule training with the Owner at least seven days in advance.

END OF SECTION